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COLORADO RIVER BASIN PROJECT
PROGRAM REVIEW, DENVER, COLORADO
APRIL 7-8, 1965

PUBLIC HEALTH SERVICE, DENVER, COLORADO

1965

PROGRAM REVIEW

**COLORADO
RIVER
BASIN
PROJECT**

**DENVER, COLORADO
APRIL 7-8, 1965**



**U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
REGION VIII - DENVER, COLO.**

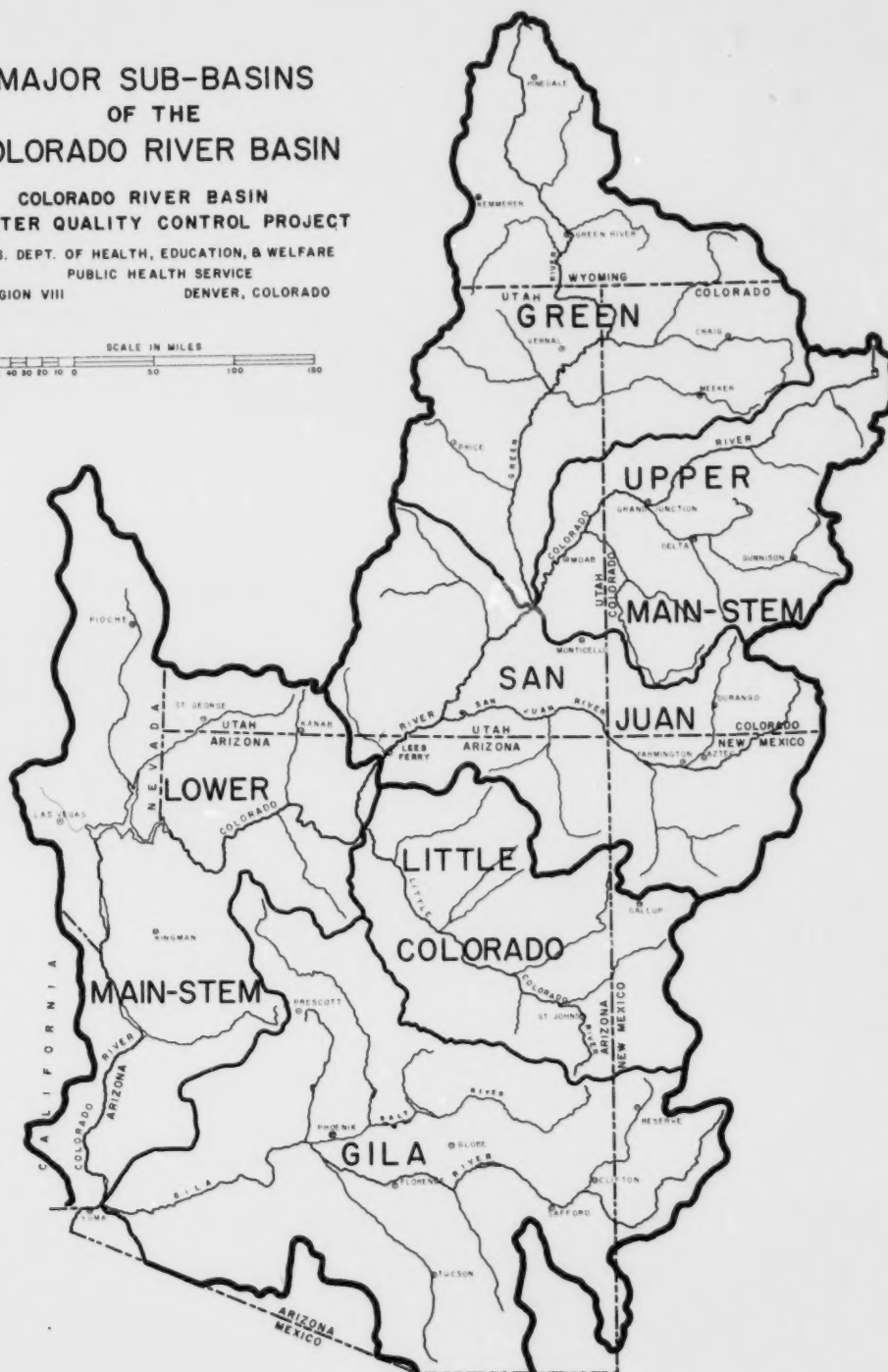
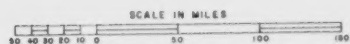
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16. Abstracts The Colorado River Basin Water Quality Control Project is a pollution study concerned with (1) identification of pollution sources, (2) estimation of effects of pollution on legitimate water uses, and (3) development of feasible pollution controls. The project's engineering activities are directed toward the identification of pollution sources, assessment of damages due to pollution from salinity, and development of feasible control measures for all sources of salinity pollution, whether they be agricultural, municipal, industrial, or natural. The economic study projects the level and pattern of economic activity for the years 1965, 1980, and 2010 by means of interindustry input-output tables. This report covers the program content as well as its organization and management.			
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MAJOR SUB-BASINS OF THE COLORADO RIVER BASIN

COLORADO RIVER BASIN
WATER QUALITY CONTROL PROJECT

U. S. DEPT. OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION VIII DENVER, COLORADO



PROGRAM REVIEW

COLORADO RIVER BASIN PROJECT

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U. S. Department of Health, Education, and Welfare
Public Health Service
Division of Water Supply and Pollution Control

Region VIII
Colorado River Basin Project
Denver, Colorado

April 1965

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2. Letters of Request for Assistance under Section 8, FWPCA, from State Water

Pollution Control Authorities in the Colorado River Basin

- a. State of Arizona - Letter from Dr. C. G. Salsbury, Commissioner of Health, dated November 4, 1959
 - b. State of California - Letter from Mr. Paul R. Bonderson, Executive Officer, State Water Pollution Control Board, dated December 4, 1959
 - c. State of Colorado - Letter from Dr. R. L. Cleere, Executive Director, State Department of Public Health, dated November 18, 1959
 - d. State of Nevada - Letter from Dr. D. J. Hurley, State Health Officer, Nevada Department of Health, dated December 1, 1959
 - e. State of New Mexico - Letter from Dr. S. J. Leland, Director, State Department of Public Health, dated November 2, 1959
 - f. State of Utah - Letter from Mr. Lynn M. Thatcher, Executive Secretary, Utah Water Pollution Control Board, dated December 3, 1959
3. Letter dated December 21, 1964 from Dr. Donald Hornig, Chairman, President's Science Advisory Committee to Secretary Celebrezze

PROJECT FACT SHEET

NAME OF PROJECT: Colorado River Basin Project

PROJECT LOCATION: Headquarters
Room 415, Building 22
Denver Federal Center
Denver, Colorado 80225

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D. E. Rushing, Director
J. G. Connor, Supervisory Chemist
N. A. Talvitie, Supervisory Chemist

DATE PROJECT AUTHORIZED: Fiscal Year 1960; January 1960 Project started.

DATE FIELD STATIONS OPENED: Field Station FY 1964; August 1963
Laboratory FY 1961; July 1 1960 first personnel.
Jan. 1961 first limited operation
May 1962 full operation.

PROJECT BUDGET:	FY	1960	\$ 80,000
	FY	1961	400,000
	FY	1962	492,000
	FY	1963	730,000
	FY	1964	580,000
	FY	1965	685,000
	FY	1966	600,000

PROJECT POSITIONS:		<u>FY</u>	<u>Authorized</u>	<u>Filled</u>
		1960	13	
(Dec. 31, 1961)	1961	43	23	
(Dec. 31, 1962)	1962	48	41	
(Dec. 31, 1963)	1963	52	40	
(Dec. 31, 1964)	1964	49	41	
(Dec. 31, 1964)	1965	49	41	
	1966	52		

IMPETUS FOR START OF PROJECT:

The Colorado River Basin Water Quality Control Project was initiated under the enforcement provisions of the Federal Water Pollution Control Act at the specific request of the water pollution control agencies of six of the seven Basin States and was subsequently concurred in by the seventh. The First Conference under the enforcement procedure was held in January 1960 and the conferees addressed themselves first to the problem of radioactive pollution. Nevertheless, at this initial Conference the conferees asked that consideration be given to all forms of pollution, and more specifically that mineralization (salinity) resulting from irrigation water use be included in the Project investigations.

STATES INVOLVED IN PROJECT AREA: Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming (See map inside front cover)

RECENT POPULATION CENSUS:

	*Population within area under Project study	Land area within area under Project study	
		Acres	Sq. mi.
Arizona	1,302,160	67,437,856	105,372
California (in Basin)	--	2,320,580	3,626
So. Calif. Water Service Area	8,900,000	3,406,720	5,323
Colorado	176,572	24,670,505	38,547
Nevada	129,447	10,515,820	16,431
New Mexico	111,988	13,108,392	20,482
Utah	80,234	25,959,688	40,562
Wyoming	38,200	11,913,443	18,615

MAJOR MAINSTEM AND MAJOR TRIBUTARIES UNDER STUDY:

MAJOR COMMUNITIES

Colorado (Lower Mainstem)
So. Calif. Water Service Area

Colorado (Upper Mainstem)

Gila
Little Colorado
San Juan
Green

Las Vegas, Yuma, Henderson
Los Angeles Metro, San Diego,
Imperial Valley
Grand Junction, Montrose,
Glenwood Springs
Phoenix, Tucson
Holbrook
Farmington, Durango,
Vernal, Rock Springs, Price,
Steamboat Springs

*Based on economic contractor's compilation using representative counties.

PROGRAM CONTENT

LONG RANGE GOALS

The Colorado River Basin Water Quality Control Project is a pollution study in the traditional pattern, in that it is concerned with (1) identification of pollution sources, (2) estimation of effects of pollution on legitimate water uses, and (3) development of feasible pollution controls. The Project is attacking one of the specific pollution problems of the Colorado--salinity--through the use of a program combining engineering and economics.

The Project's engineering activities are directed toward the identification of pollution sources, the assessment of damages due to pollution from salinity, and the development of feasible control measures for all sources of salinity pollution, whether they be agricultural, municipal, industrial, or natural.

The economic study is projecting the level and pattern of economic activity for the years 1965, 1980, and 2010 by means of interindustry input-output tables. An analysis of water quantity as a constraint on the level and pattern of economic activity is also underway, using expected water demands for the periods 1965, 1980, and 2010. An analysis of the relation of benefits to costs, based on present and projected future water quality with various combinations of programs for control of salinity sources, is an integral element in merging the engineering-economic components. Using the economic projections similar analyses will be made for the periods to 1965, 1980, and 2010, taking cognizance of changes decreed by the U. S. Supreme Court's allocation of water and the development of various water resource projects proposed by various construction agencies within the study period.

It is anticipated that a program for the control of pollution for the interstate waters of the Colorado River Basin and its tributaries can be

recommended to the Conferees during Fiscal Year 1967. The justification for any measures recommended to control saline pollution will be based on the adverse effects of such pollution on the development of the Colorado River Basin.

A more detailed description of the Project's operation is given in the following outline of the several operating programs and contracts. The Project activities sequence charts which follow explain the sequential basis for accomplishing Project objectives. Each operating section, whether it be Pollution Control Benefits, Pollution Control, the Field Station, the Laboratory, the Economic Contractors, or Radiological Pollution Control, has been scheduled to provide the necessary information in accordance with this sequence.

Pollution Identification Program. The Field Station, located at Phoenix, Arizona, develops and analyzes data and prepares interpretative reports directed primarily toward identifying the major salinity sources in the Colorado River Basin and characterizing the salinity discharges from these sources. Involved in this activity are a sampling program integrated with flow-gaging stations, intensive special-purpose studies in selected areas, and the collection of relevant information on environmental factors such as rainfall, runoff, geology, soil types, groundwater conditions, irrigation practices, and other water uses. Irrigation drainage returns, springs, brine seeps, and the natural products of the weathering of rocks and soils are included, as well as water losses that degrade the quality of the remaining supply.

Some of this information is available from other agencies and has been used to provide a broad picture of water quality changes with respect to time and distance. The Project must, in addition, pinpoint specific sources of pollution, and for this purpose further data has had to be collected. Long-range patterns of water quality changes have been analyzed, using all available data and special reconnaissance surveys. Based upon these analyses and surveys,

the field program has been designed to identify those areas where significant water quality changes occur. The field staff then assembles water-use information for those areas so that a definitive picture of pollution contributions can be developed.

A sketch of the pollution source identification program can be seen in the maps of the Lower and Upper Colorado River Basins in Appendix A of this document. Results from samples collected for the past year from forty locations in the Lower Main Stem Sub-Basin are now being evaluated. Thirty-three of these locations were sampled by Project personnel and seven by other cooperating agencies. The current program involves sampling at 111 locations in the Upper Basin (74 by the Project, 37 by USGS and USBR). The USGS furnishes flow data from 62 permanent flow measurement stations. In addition, 13 nonrecording gages have been established and stage-discharge measurements are being made by USGS for the Project. Quality data is also available from more than 100 other locations being sampled by the Bureau of Reclamation. Cooperative sampling programs are being carried out in several areas in the Upper Basin in order to avoid duplication of effort. In addition, two locations on the Little Colorado River are being studied by the Project and water quality information is being received regularly from the U. S. Geological Survey for six locations in the Gila River Sub-Basin. At present eight municipal and twelve industrial waste sources are being evaluated by the Project in the Upper and Lower Basins.

Analyses are performed on the samples submitted to the Project Laboratory for the following parameters:

Conductivity	Sodium	Chloride
pH	Potassium	Sulphate
Calcium	Bicarbonate	Total Dissolved Solids
Magnesium	Carbonate	Total Hardness

In addition to these analyses, other analyses to identify organics, pesticides, and radionuclides have been made at selected points for specific purposes. These will also be continued on a need basis.

Pollution Control Benefits. Pollution damage and control benefits are being assessed in the three major areas of greatest existing or potential economic development, i.e. southern California, central Arizona, and southern Nevada. The task of damage assessment is to appraise the physical and economic effects of salinity and hardness on the principal beneficial uses of water, existing and potential, in the Colorado River Basin. Physical effects involve any modifications in the environment and in human activities imposed by changes in water quality. Economic effects involve direct costs to the user as a result of water quality degradation for any given production process. Production process in this context refers to all water uses, domestic, industrial, agricultural, and other. Economic effects also include net losses incurred from necessary shifts in production processes or crop patterns, etc., which must take place as the result of water quality degradation.

The importance of the central concept of "pollution damage assessment" may be exemplified in the following program for analyses of agricultural and municipal uses. Damages due to past increases in hardness and salinity between a selected base period and 1964 have been estimated, for example, for the Lower Main Stem Sub-Basin of the Colorado. Damages which will arise from anticipated future degradation of mineral quality of water supplies, between 1964 and 2010, have also been calculated in part.

Salinity damages are being calculated for three types of water supplies: agricultural, municipal, and industrial. This report deals with the premises and methods used to evaluate penalty costs of mineralized water in those three uses of water.

Agriculture. Three significant damages incurred by agricultural water users due to high salinity concentration in irrigation water were considered: (a) leaching requirements, or the need for water, in addition to consumptive use requirements, to leach salts out of the soil and prevent a salt accumulation in the root zone that would result in a crop yield decrement in excess of 10 percent; (b) drainage requirements, or the drainage facilities necessary to handle the leach water; (c) fertilizer losses, or the amount of fertilizer, particularly nitrogen, lost in the process of leaching the soil. The methods and assumptions used to evaluate the three types of agricultural penalty costs are discussed in the following paragraphs. Increase in salinity has the tendency to increase water requirements for leaching, thus increasing both monetary costs and volumes of water.

Leaching Requirements. The amount of water necessary to provide proper leaching has been calculated using formulae developed by the U. S. Department of Agriculture's Salinity Laboratory at Riverside, California. The methods, assumptions, and values used in the calculations for leaching requirements were reviewed and found acceptable by a Project Consultant, Mr. Lloyd V. Wilcox, former Deputy Director, U. S. Salinity Laboratory, USDA.

Drainage. Information received from the managers of several irrigation districts indicates that land that has a water table 4 to 6 feet below the ground surface is marginal as to drainage need. This land will require drainage in the future if additional water is put on the land for leaching purposes. Information on the location of the groundwater table, the proper drain spacing, and the cost of drainage facilities was obtained from the various irrigation districts.

Two separate costs are included in the total annual drainage penalty cost: (1) capital construction, (2) maintenance and operation. The cost of drainage facilities that will be needed in 2000 can be calculated with the amount of drainage necessary and the unit cost of drainage facilities. It is assumed that the need for additional drainage facilities in the future is recognized now and that a sinking fund will be established in order that the necessary money will be available in 2000. The annual payment to the sinking fund is the annual penalty cost due to the necessary capital construction. The maintenance and operations costs are established by calculating the cost per acre in each irrigation district over the past few years, and applying the average value to the number of acres that will need drainage in the future. The average cost per acre for maintenance and operation of drainage facilities varies with each district. The sum of the annual sinking fund payment and the annual maintenance cost gives the total annual penalty costs for additional drainage.

Fertilizer. Average rates of fertilizer application and unit cost values were developed by the Field Station staff and are used in the evaluation. The annual penalty cost reported is the difference between the 1964 annual cost and the 2000 annual cost.

Approximately 29-45 percent of nitrogen fertilizer applied can be lost if leaching is practiced. These two values were used to calculate the maximum and minimum losses in 1964. In the future when greater quantities of leaching water are applied to the land, more nitrogen will be lost. For the year 2010 it is assumed that the additional nitrogen loss will be proportional to the greater amount of leaching water applied. This assumption is believed to be conservative.

Municipal. Present damages to municipal uses were estimated relative to pristine conditions prior to modern economic development. Future damages were based on the anticipated increase in hardness concentration from the present to the year 2000.

Taste. The salinity "taste" is highly unsatisfactory to many people, leading to demands for either desalinization plants or new and distant sources of water.

Evaluation of Present and Projected Damages Due to Hardness. Hard water has many deleterious effects on consumers including increased soap consumption, scaling, accelerated fabric wear, etc. However, only a few of these effects can be evaluated quantitatively in light of present knowledge.

Increased hardness in the domestic water supply will cause an increase in the cost of operating a home water softener for that portion of the citizenry using home units. For example, 20 percent of the residents of Yuma, Arizona, presently use home softeners. Since the water is projected to become harder, this 20 percent of the population will pay a higher cost per 1000 gallons softened. Therefore the incremental damage to this portion of the populace is the difference between the cost per 1000 gallons they will pay in the year 2000 and the cost per 1000 gallons they are currently paying.

Another result of increased hardness will be that home softeners will become more prevalent. Thus, the annual damage to those people who will be induced to use home softeners in response to the increased hardness is the annual cost of renting a unit or the amortized cost of purchasing and generating the unit.

Wastage of Soaps and Detergents. The gross savings in detergents, soaps, and other cleaners per capita per 100 ppm hardness reduction has been estimated at \$1.15 per year, in an article based on water uses in Illinois.

In the Colorado Basin, where water use for purposes requiring softened water is higher per capita, it is further estimated that the saving would be \$1.28 per capita per 100 ppm hardness reduction.

Central Softening Plants. The estimated present and projected cost of municipal softening is based on an article by Howson, "Economics of Water Softening." He estimates the cost of central softening to be \$.05 per 1000 gallons for the first 100 ppm hardness reduction and \$.0125 per 1000 gallons for each subsequent 100 ppm hardness removed. These figures are for plants whose capacity exceeds 20 mgd. The unit treatment costs increase for plants with smaller capacities.

In its assessment of damages the Pollution Control Benefits Section is also responsible for developing a comprehensive picture of water uses in the Colorado River Basin and its tributary areas. Coupled with this water use inventory is an appraisal of the water quality parameters which should be evaluated for each legitimate water use.

Pollution Control Studies. A waste source inventory, being developed by the Pollution Control Section, will identify the significant municipal, industrial, agricultural, and natural waste sources in the Basin. Pollution control measures are being considered for the most significant sources. Methods of pollution control which are being considered include (1) preventing natural brines from entering the main stem or tributaries; (2) dilution of salts by regulating streamflow, which involves a network of reservoirs and operating schedules; (3) reducing water losses from evaporation and evapotranspiration; (4) lessening the contribution of highly saline groundwater to the streams by control of groundwater hydraulics, for example, minimizing the use of excess irrigation water and decreasing canal conveyance losses which percolate to the groundwater table and raise it; and (5) limiting the practice of using water in excess of needs for various purposes.

Close coordination with those agencies having construction and research responsibilities in these areas is considered an important requirement in the success of this program. Each significant pollution source is being evaluated with respect to its relative effect on water quality, the engineering feasibility of its control, and the associated cost.

Economic Studies. An economic study of the Colorado River Basin is being conducted under two major contracts, as a means of assessing present and potential economic consequences of salinity pollution. It is anticipated that the major portion of the economic contracts will be completed by August 1965. An extension of the contract will be necessary to complete the analyses for quality constraints on the Colorado River Basin economy and to merge the engineering-economic elements of the Project program.

University of New Mexico. A contract with the Department of Economics calls for the development of forecasts of economic activity in the Colorado River Basin using interindustry input-output tables. The Project's economic contractor was selected because of his intimate associations and familiarity with the development of the Colorado River Basin. Economic sectors including government, trade, services, and utilities, as well as the overall job of coordinating the work of the various economic study participants, are the responsibilities of the New Mexico group. A subcontract with the University of Colorado's Institute of Behavioral Science, to prepare the input-output tables and the projections of the manufacturing and mining sectors have been let by the University of New Mexico. Population projections for the Colorado Basin are being prepared by Dr. William Leasure of San Diego State University.

Economic Research Service, U. S. Department of Agriculture.

Under a memorandum of understanding with this agency, the Project has contracted to obtain agricultural projections and agricultural components for the input-output tables.

Radiological Pollution Control. The primary concern of the states during the first years of the Project was radioactive pollution from industrial and natural sources. At the fourth and fifth sessions of the Conference, in May 1963 and May 1964, the Conferees were informed that the Colorado River's radioactive content is consistently below those levels recommended as maximum for drinking water by the Public Health Service. A surveillance network of monitoring stations has been established to detect radioactivity and insure protection of downstream water users. Special studies included in this activity are the evaluation of radiochemical concentrations in river sediments, farm fertilizers, and consideration of the problem of ultimate disposal of uranium mill tailings.

CONSULTANTS

Lloyd V. Wilcox, Riverside, California. Mr. Wilcox, retired Assistant Director of the U. S. Salinity Laboratory of the Department of Agriculture, was retained to advise the Project upon techniques for estimating the physical and economic effects on crops and soils, resulting from use of saline irrigation water; and to suggest feasible methods for reduction of damages from that cause. His services have included advice on salt tolerance of crops, methods for estimating leaching-water requirements, calculation of losses of fertilizers due to leachings, land-drainage requirements, and the duration and magnitude of salt imbalance on newly irrigated land.

Blair T. Bower, Albuquerque, New Mexico (Services arranged through the Economic Contractor, University of New Mexico). Mr. Bower is a consulting professor in civil engineering and economics in the Department of Civil Engineering, University of New Mexico. His services to the Project have comprised advice on such problems as the methodology of estimating the economic effects of water pollution; on the utilization of an input-output model in projecting economic activities and their associated water demand; on the conversion of economic data, expressed in monetary values to specific units of industrial output; and on procedures for determining the optimum economic level of water quality in a water resources system.

Dr. E. C. Tsivoglou, Cincinnati, Ohio. Dr. Tsivoglou is In Charge, Physical and Engineering Sciences, Field Operations Section, Technical Services Branch of the USPHS Division of Water Supply and Pollution Control. His services to the Project consist of advice and direction in the radiological surveillance program in order to coordinate Project investigations with earlier studies in the field of stream pollution resulting from waste discharges by the uranium mining and milling industry. The advice includes suggestions

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on methods and frequency of sampling of uranium milling effluents and radio-activity carrying media in streams, aid and furnish suggestions for the investigation of the problem of ultimate disposition of uranium mill tailings pile material, and advice on methods of interpreting radiological data.

COMMITTEES

Except for an annual Technical Review of Project activities by the Conferees, no formal or informal committees to the Project have been formed.

Arrangements have been made to keep representatives of the various Colorado River water use interests informed on a regular basis by personal contact.

ACTIVITIES AND ACCOMPLISHMENTS THROUGH FY 1965Accomplishments through January 1, 1965

Project progress is measured not only in achievement of planned objectives, but also in overcoming major obstacles. For a period of almost four months the Project activities were subjected to stringent restrictions as the result of Section 206 of the 1965 DHEW Appropriations Act (See Support Statement for background - Appendix B). The President's Science Advisory Committee was required to pass on the expenditure of funds by the Project for salinity and irrigation water quality studies. After intensive review by a special panel from the Committee, unqualified approval was given to the Department in these activities (copy of letter to Secretary Celebrezze from Dr. Donald Hornig may be found in Appendix B, last two pages).

Investigation and recommendations by a Colorado River Basin Project staff member concerning an incipient oil brine pollution problem in the vicinity of the Ouray Wildlife Refuge near Vernal, Utah, resulted in a cooperative correction program involving the industry, Federal, state, and local people. Our involvement came at the direct request of the Regional Director, Bureau of Sports Fisheries and Wildlife.

Since November 1964, the Bureau of Reclamation, Region IV, Salt Lake City, has carried out cooperative arrangements with the Colorado River Basin Project field staff to dovetail sampling operations to minimize duplication of effort.

The Bureau of Reclamation has given recognition to benefits from flow augmentation for quality control in its Central Utah Project. This

hitherto unprecedented acceptance was based directly on reports prepared by the Regional Office and Colorado River Basin Project staff for that project.

Under a contract with Colorado State University, a mileage coding for data retrieval for the Colorado River Basin has been completed.

At the fourth and fifth sessions of the Conference, in May 1963 and May 1964, the Conferees were informed that the Colorado River's radioactive content is consistently below those levels recommended as maximum for drinking water by the Public Health Service. Within a period of three years, close cooperation between the seven states of the Basin, DHEW, several mining and milling industries, and the Atomic Energy Commission brought about this improvement through effective control.

The Project has made significant progress during the past year. Salinity load sampling has been completed for the Lower Main-Stem. The statistical analyses for time and distance trends are essentially complete for the Upper and Lower Basins; approximately 10 significant areas of salinity build-up and 27 major natural sources were defined; an inventory of salinity sources was prepared; preliminary reports on proposed methods of salinity control for Paradox Valley and the Virgin Rivers were prepared; assessment of damages to water uses in the Lower Main-Stem are 75 percent complete - for the Colorado River water service area in Southern California about 25 percent complete; projections of domestic water demand have been completed for 1980 and 2010 in all counties of four sub-basins; preliminary estimates of future water demand for the six major manufacturing categories in the Basin have been made; and the laboratory has performed 15,210 analyses

on 1,228 inorganic samples and 2,098 determinations on 728 radiochemical samples.

The Economic Contractor has completed the population forecasts for all sub-basins; essentially completed the preliminary input-output tables for all sub-basins; is about 30 percent complete on the final input-output tables; and is essentially on schedule for the final demand sector of the preliminary projections.

STORET

The Project has maps coded to STORET for all of the Colorado River Basin. All Radiological Surveillance water and sediment sampling stations (170) have been index coded. The Inorganic Laboratory Section has transferred analytical data for some 300 samples to STORET forms. All current data is routinely posted on STORET forms. Radiological data is being posted on STORET forms by the Radiological Section in Denver.

At the present time, the values of STORET to Project objectives and ultimate program objectives in the Colorado River Basin are being assessed.

Economic Studies

The economic study is being conducted by the University of New Mexico in collaboration with the University of Colorado. The demographic portions of the economic study have been conducted by a demographer at San Diego State College. The Public Health Service has negotiated a separate agreement with the U. S. Department of Agriculture providing for all components of the study relating to agriculture and forestry.

Virtually all of the field work on the nonagricultural aspects of the economic study was completed during the first half of the current fiscal year. There is one important gap which remains to be filled, however, and this is the collection of data on capital expenditures by means of a mail survey. The survey cannot be conducted until Bureau of the Budget approval of the questionnaire has been obtained. The capital data will be an important supplement to the data on interindustry transactions which have been collected by the Universities of New Mexico and Colorado to form the basis of the six input-output tables which will describe the economic structure of the Colorado River Basin. Work on the tables has progressed according to schedule, and it is anticipated that the integrated and reconciled sub-basin tables will be completed by the end of the current fiscal year.

Concurrently with the construction of the sub-basin input-output tables, the economic contractors have been gathering data on water-use for each of the sectors. It is anticipated that water-use coefficients for all of the non-agricultural sectors will be computed before the end of the current fiscal year. Depending upon the availability of data, it is also hoped that

such coefficients can be computed for the agricultural sectors.

Work is also currently under way on the revision of all projections of final demand to 1980 and 2010. At the same time, progress is being made on the projection of technical coefficients for the three lower sub-basin tables, and the technical coefficients for all six sub-basins will have been projected by the end of the current fiscal year. The two sets of projections, those of final demand and of the technical coefficients, will serve as the basis for the projection of interindustry transactions in 1980 and 2010. Water-use coefficients will then be integrated with the input-output model to provide projections of water demand in the two target years. In making these projections, a water quantity constraint will be taken into account; that is, it will be assumed that the present allocation of water by sub-basin will remain unchanged through 2010.

A dynamic model (for projecting the interindustry transactions) and patterns of water-use (to 1980 and 2010) ^{has} ~~have~~ been developed. The method to be employed, together with a set of illustrative projections, is described in an interim report, Illustrative Inter-Industry Projections of the Lower Sub-Basin Economies to 1965, 1980 and 2010, prepared by William H. Miernyk, Acting Project Director of the economic study, and submitted to PHS on November 23, 1964. This report describes the way in which the technical coefficients will be projected, as well as the methods used in projecting final demand sector by sector. In conjunction with the long-range projections, a series of industrial location studies are being conducted by the University of New Mexico in an effort to anticipate the kinds of economic activity which might be represented in the Colorado River Basin in 1980 and 2010, but which

were not in the Basin in 1960. Engineering-type technical coefficients will be developed for any activities of this kind and these will be inserted in the projected input-output tables. Changing interregional trade patterns will also be taken into account in making the long-range projections. Use of the dynamic model will obviate one of the criticisms that has been made against input-output projections in the past, namely that they are based on fixed technical coefficients. It is anticipated that this method will give far more realistic projections of the levels of economic activity in each of the sub-basins in the target years as well as the consumptive use of water in each of the sectors in those years.

Work is also continuing on the development of an optimizing model which will help bridge the gap between engineering and economic studies. It is not anticipated that this part of the study will be completed during the current fiscal year.

Present plans call for the completion of all analytical work on the input-output tables, the long-run projections of population and labor force, and the projections of interindustry transactions by the end of the current fiscal year. If the capital data are not obtained by the proposed mail survey, there will be a gap in the study, and the contractors will be unable to ascertain whether or not there is a capital constraint on the growth of certain types of economic activity in the Colorado River Basin. Further time will also be required for the preparation of a final report. It is now anticipated that this report can be completed by June of 1966.

The Project staff have collaborated in several ways in furthering the Economic Contractor's work. In August 1964 a preliminary study and report entitled "Water Quality Demands for Major Manufacturing Groups in the Colorado River Basin" were completed. In that report estimates were developed for the total intake water requirements in 1965, 1980 and 2010 in six types of manufacturing industries in the Basin. In addition data were compiled on the percentages of industrial water intake which are consumed and recirculated. The estimates of water demand were based on illustrative projections of industrial activities which were furnished by the Economic Contractor in December 1963.

In January 1965 the Project staff completed a second report entitled "A Study of Municipal, Rural Domestic and Livestock Water Requirements in the Colorado River Basin." In this report estimates are made of the water requirements for the stated uses in 1965, 1980 and 2010. These estimates are based upon projections of population growth and of livestock production furnished by the Economic Contractor and the Economic Research Service of the Department of Agriculture.

The Project has done considerable research in the area of agricultural water demand, and has available for the Economic Contractor's use much data on gross farm delivery and leaching water requirements, consumptive use by crops and by areas, and other relevant statistics. Most of the work done by the Project staff in the latter categories pertains to the Lower Basin.

In December 1964 an arrangement was made with the Economic Contractor whereby the Project will provide advisory service in developing water use coefficients which will enable the Contractor to convert projections of

economic activities, expressed in dollar values, to intake water requirements for the major industries in the Basin.

The delays due to section 206 and the lack of approval of field questionnaires will necessitate extending the contract with the University of New Mexico through FY 1966. An additional \$40,000 will be needed to cover this extension of the contract.

To facilitate merging of the engineering and economic components of the overall study, the Project plans to have a Region VIII economist assigned to the Project for a period of six months starting June 1, 1965. The economist is Mr. George Collins, GS-12, presently taking Division sponsored graduate work at Colorado University on a full time basis.

LIST OF REPORTS
ECONOMIC STUDIES OF COLORADO RIVER BASIN PROJECT

1. A Preliminary Economic Base Study of the Animas-La Plata Pilot Project Watersheds in the Four Corners Area of the Colorado River Basin
2. The Purpose and Plan of an Economic Base Survey of the Colorado River Basin
3. Illustrative Interindustry Projections of the Lower Sub-Basin Economics to 1965, 1980, and 2010 - W. H. Miernyk
4. An Interindustry Study of the Economy of the Green River Sub-Basin of the Colorado River Drainage Basin in 1960 with Emphasis on Heavy Water-Using Industries - Bernard Udis
5. An Analysis of the Economy of the Three Lower Sub-Basins (Lower, Main Stem, Gila, Little Colorado) of the Colorado River Drainage Basin in 1960 with Emphasis on Heavy Water-Using Industries - Volumes I and II
6. Population Projection for the Three Upper Sub-Basins of the Colorado River Basin
7. An Economic Analysis of Agriculture and Forestry in the Little Colorado River Sub-Basin, Colorado River Basin
8. A Survey of the Agricultural Economy of the Gila Sub-Basin for 1960; with Projections for 1965, 1980, and 2010.
9. Use of Land and Water for Irrigated Crop Production Lower Colorado River Basin.
10. Selected Data Describing Agricultural Characteristics of the San Juan River and Upper Main Stem Sub-Basins, Colorado River Basin.
11. An Interindustry Analysis with Emphasis on Water and Related Land Resources Used by Agriculture and Forestry, Green River Sub-Basin, Colorado River Basin.
12. Some Economic Features of Agriculture and Forestry in the Lower Main Stem Area of the Colorado River.

Stream Measurement Studies

Sampling programs have been developed for each of the six sub-basins to determine the current nature, magnitude, and distribution of saline pollution in natural streams. The results of the statistical analysis of historical data on water quality are used in selecting appropriate salinity load sampling sites. Permanent stations are established at key locations where sampling is carried out for at least one full year. Temporary sampling stations are utilized at less important locations where short-term sampling will provide adequate data.

A detailed review has been made of all existing quality and stream flow data for the sub-basins. Tentative salinity load sampling programs have been formulated for streams in each sub-basin. The sampling programs are reviewed with representatives of the U. S. Geological Survey and other interested agencies. When possible, existing stations at which quality data is being collected by other agencies have been incorporated into the salinity load sampling programs in order to minimize duplication of effort. In the development of the final sampling programs, a field reconnaissance has been made of each sub-basin at which time each sampling point was evaluated and a definite location selected for collecting samples. Maps, showing the location of all sampling sites, and a detailed description of each station have been prepared. Prior to initiation of sampling in each sub-basin, the station's proposed salinity load sampling program, station descriptions, together with information pertaining to proposed sampling frequency, were

submitted to the Chiefs of the Pollution Control Benefits and Pollution Control Sections for review in order for them to determine whether or not the proposed sampling program will provide the data needed by their sections. Their recommendations have been incorporated into the final sampling programs. The Physical and Engineering Science Unit, Technical Services Branch, Division of Water Supply and Pollution Control, was requested to provide technical assistance on the design of the sampling programs and data analysis.

Arrangements were made for obtaining stream flow records from other agencies for as many sampling locations as possible. Where the need exists, additional stream gages were established. In many situations it was possible to arrange for the U. S. Geological Survey to install the necessary gages.

At stations which are sampled by station personnel, grab samples will be collected at weekly or two-week intervals depending upon their accessibility and relative importance, and the frequency required to provide the input data needed. Aquatic samplers are utilized to the fullest extent possible for collection of samples and related activities, such as conductivity measurements and servicing of conductivity recorders.

The salinity load sampling activities which were initiated in the Lower Main Stem and Little Colorado River Sub-Basins during FY 1964 were continued into FY 1965 (see map showing sampling sites, Appendix A). Based upon an analysis of analytical results obtained, seven sampling sites in the Lower Main Stem Sub - Basin were found to be redundant or insignificant and were eliminated during the summer. Sampling was discontinued at the end of October at all stations below Hoover Dam, since a full year of quality data had been collected at these sites. Sampling at stations above Hoover Dam as well as

those in the Little Colorado River Sub-Basin was continued through January 1965 at which time one year of data had been accumulated.

Through field surveys and sampling programs, data was obtained on salinity contributions from the major irrigated areas in the Lower Main Stem Sub-Basin. A draft of a report was prepared explaining observed past and present salt and flow imbalances in the Parker Dam-Cibola reach of the Colorado River. Reconnaissance work and planning activities were initiated on the evaluation of salinity sources associated with irrigation in the Green, San Juan, and Upper Main Stem Sub-Basins.

Detailed field reconnaissance and evaluation studies were completed for the Gila Sub-Basin which showed that the major increases in salinity concentrations in the Gila and Salt Rivers occur above the major impoundments and downstream from the Arizona-New Mexico Border. No evidence of significant interstate pollution was found in the upper reaches of the Gila River. The reaches of the river where significant natural or man-made sources of salinity occur were delineated; however, they are confined primarily to the State of Arizona.

Field work required for the Little Colorado Sub-Basin was also considerably less than originally anticipated. Thus, it was possible to initiate Field Station activities in the Green, San Juan, and Upper Main Stem Sub-Basins during FY 1965.

Bi-weekly conductivity monitoring of municipal effluents was continued through January 1965 at St. George, Utah; Las Vegas, Nevada; Needles, California; and Yuma, Arizona. Samples for chemical analysis were also collected from each

of these four municipal effluents during December. A survey of the Upper Colorado River Basin was made during November for the purpose of updating the municipal and industrial waste inventory data that were collected by Project personnel several years ago. During this survey, samples for chemical analysis were collected from 30 municipal effluents and four industrial effluents. Salinity loads contributed by these sources were computed and those sources of significance will be monitored by bi-weekly conductivity measurements and sampled quarterly for chemical analysis.

A preliminary report entitled "Short-Term Study of Chemical Precipitation in the Lower Colorado River" was prepared covering the cooperative survey conducted by personnel of the Project and U. S. Geological Survey during the period February 18-27, 1964. It was concluded that there was no chemical precipitation other than calcium carbonate during the period of the study, within the Hoover Dam-Northerly Border reach of the Colorado River. Further office studies are in progress to estimate the net change in salt burden and change in proportions of constituent ions, indicative of the effects of agricultural use.

During the Fifth Session of the Conference in the Matter of Pollution of the Interstate Waters of the Colorado River and Its Tributaries, the conferees requested that the analytical results of the Project's salinity sampling program be made available to them. Tabulations of laboratory results for all salinity samples collected through September 1964 have been sent to the conferees.

Sampling programs were developed to determine the nature, magnitude, and distribution of saline pollution in natural streams within the Upper Colorado River Basin (see map showing sampling sites, Appendix A). Salinity load sampling

activities were initiated by Field Station personnel during October 1964 in the Green, San Juan, and Upper Main Stem Sub-Basins. Arrangements were made to have the U. S. Geological Survey install wire-weight gages and make flow measurements at 13 sampling sites where no flow data are available.

It is expected that all major Field Station activities in the three lower sub-basins of the Colorado River will be completed by the end of FY-1965 (see work programming and personnel utilization charts). Field Station activities in the Green, San Juan, and Upper Main Stem Sub-Basins will be expanded and intensified during the remainder of the fiscal year. The statistical analysis of existing water quality data for these three sub-basins will be completed by the middle of April. Salinity load sampling and other field activities pertaining to the identification and evaluation of salinity sources and the evaluation of salinity concentration factors will proceed at increasing tempo in the Upper Colorado River Basin.

A field depot has been established at Grand Junction, Colorado in March 1965 to facilitate field work in the Upper Basin. This depot will be used primarily for the storage of field equipment and supplies and for the repair and maintenance of conductivity recorders and other equipment. It will also serve as an operating base for field personnel. Two engineers, an engineering technician, two aquatic sample collectors, and a laboratory mechanic will be detailed to Grand Junction to carry out salinity load sampling, intensive surveys and other field activities in the Upper Colorado River Basin. The Phoenix Field Station will be phased out and personnel and equipment will

be transferred to Project headquarters in Denver, Colorado at the end of FY 1965, to staff the Field Studies and Evaluation Section.

Special Techniques

The Project has employed special techniques in several areas to accomplish immediate and long term objectives. Of paramount importance has been the development or adaptation of analytical techniques for radio-chemical elements in water. The Laboratory Radiochemical Unit has developed universally accepted improved techniques for measuring radium-226 in water. It has developed sensitive techniques for lead-210, polonium 210 and thorium, as well as strontium-90. The Laboratory and its director are used as a "referee" and training facility by industry, States, other Federal agencies, and international elements. Mr. Rushing and his staff are a rare and valuable resource.

In the development of a program for ultimate control of uranium mill tailings piles, the Radiological Section is using aerial survey techniques to help define the problem and to get a reasonable quantitative estimate of pile size and volume. This will obviate extensive stadia surveys which are time-consuming and expensive.

In a river basin comprising some 200,000 square miles, the logistics of a sampling program require special consideration. This is particularly true in relatively inaccessible locations where conductivity meters are used. The use of this type of device reduces the amount of manual sampling required. Because of fouling and other maintenance problems, meters adapted especially for the Project have been developed. In addition to the non-clogging feature of the cell unit, the meters will provide a continuous record for 28 days. Conductivity versus chemical constituent relationships will be determined from chemical analyses of samples collected at the time of routine meter servicing.

All historical quality data from both published and unpublished records for the principal streams in each of the sub-basins have been compiled and studied. From these long-term records, data have been selected which are considered to be appropriate, representative, and reliable for statistical studies. These data are analyzed by statistical methods to determine the pattern of increases or decreases in salinity concentrations and loadings in relation to time and distance.

The time pattern is analyzed in relation to the history of water use and other developments, such as the impoundment of major reservoirs, establishment of irrigation projects, and exportation of water from the basin. Analysis of variance is used for comparison of categorical variance with the pooled or universe variance. The distance pattern is analyzed with the view of identifying reaches of streams where significant salinity build-up occurs. In the distance studies, the student's "t" test is employed for comparing data for sequential pairs of stations.

LIST OF PROJECT REPORTS AND OTHER PUBLICATIONSCompleted Reports

<u>Number</u>	<u>Title</u>	<u>Date of Publication</u>
PR-1	A Study of Colorado River Water Quality near Yuma, Arizona	June 1961
PR-2	Stream Surveys in Vicinity of Uranium Mills - I. Area of Grand Junction, Colorado - August 1960	Sept. 1961
PR-3	Stream Surveys in Vicinity of Uranium Mills - II. Area of Moab, Utah - August 1960	Sept. 1961
PR-4	Stream Surveys in Vicinity of Uranium Mills - III. Area of Uravan, Slick Rock, and Gateway, Colorado - August 1960	Sept. 1961
PR-5	A Preliminary Investigation of Radioactivity in Crops and Soils of Selected Areas	Oct. 1961
PR-6	Stream Surveys in Vicinity of Uranium Mills - IV. Area of Shiprock, New Mexico - November 1960	Feb. 1963
PR-7	Shiprock New Mexico, Uranium Mill Accident of August 22, 1960	June 1963
PR-8	Preliminary Investigation of Selected Water Quality Conditions in Lower Colorado River-Parker Dam to Morelos Dam	Oct. 1963
PR-9	Studies on the Effect of Forest Insect Control with Ethylene Dibromide on Water Quality	Nov. 1963
PR-10	Radiological Content of Colorado River Basin Bottom Sediments	Oct. 1963
PR-12	Annotated Bibliography of the Effects of Irrigation Practices on Stream Water Quality with Emphasis on Salinity and Pesticides	Jan. 1964
PR-13	Physical and Chemical Stratification in Two High Altitude Reservoirs of the Colorado River Basin	Dec. 1963
PR-14	Protection of Domestic Water Supplies and Studies of Pollutational Parameters during the Green River Fish Control Project	July 1964

<u>Number</u>	<u>Title</u>	<u>Date of Publication</u>
BD-1	State and County Area Tabulations for the Colorado River Basin	Jan. 1962
BD-2	1960 Directory of Manufacturers for the Colorado River Basin	Jan. 1962
BD-3	River Mileage Tabulations for the Colorado River Basin - Communities and Major Tributaries	Feb. 1962
BD-4	1960 Directory of Mining for the Colorado River Basin	May 1962
BD-5	Land Ownership in the Colorado River Basin	Jan. 1963
None	Discussion of an Economic Base Study for the Colorado River Basin Water Quality Control Project	May 1961
ER-1	A Preliminary Economic Base Study of the Animas-LaPlata Pilot Project Watersheds in the Four Corners Area of the Colorado River Basin	July 1962
ER-2	The Purpose and Plan of an Economic Base Survey of the Colorado River Basin	Jan. 1963
None	Radioactivity in Water and Sediments of the Colorado River Basin, 1950-1963, Radiological Health Data, Vol. IV, No. 11	Nov. 1964
DR-1	Radium Monitoring Network - Data Release No. 1	Oct. 1962
DR-2	Radium Monitoring Network - Data Release No. 2	Jan. 1963
DR-3	Radium Monitoring Network - Data Release No. 3	July 1963
DR-4	Radium Monitoring Network - Data Release No. 4	Jan. 1964
DR-5	Radium Monitoring Network - Data Release No. 5	July 1964
DR-6	Radium Monitoring Network - Data Release No. 6	Jan. 1965

Reports in Preparation

<u>Tentative Title</u>	<u>Stage of Preparation</u>	<u>Expected date of publication</u>
Colorado River Salinity Problem Study - Yuma, Arizona Area	Draft only	June 1966
Radioactivity in Dolores-San Miguel River Sediments	Draft only	June 1966
Gunnison-Grand Valley Area Study	Draft only	June 1966
Preliminary Water Quality Control Study, Dolores River, Paradox Valley, Montrose County, Colorado	Draft only	June 1966
A Study of Municipal, Rural Domestic and Livestock Water Requirements in the Colorado River Basin	Draft only	June 1966
Preliminary Water Quality Control Study, Virgin River; Utah, Arizona, and Nevada	Draft only	June 1966
Statistical Analysis of Existing Water Quality Data, Lower Colorado River	Draft only	June 1966
Statistical Analysis of Existing Water Quality Data, Upper Colorado River	Draft only	June 1966
Short Term Study of Chemical Precipitation in the Lower Colorado River	Draft only	June 1966
Salt and Water Imbalance in the Colorado River Between Parker Dam and Cibola, Ariz.	Draft only	June 1966
Results of Intensive Water Quality Surveys, Geohydrological Studies in the Upper Basin	Draft only	June 1966
Salinity Contributions on Overland Run-off	Draft only	June 1966
Preliminary Water Quality Control Study, Dotsero Springs Area	Draft only	June 1966
Preliminary Water Quality Control Study, Blue Springs Area	Draft only	June 1966
Preliminary Water Quality Control Study, Meeker Springs Area	Draft only	June 1966

<u>Tentative Title</u>	<u>Stage of Preparation</u>	<u>Expected date of publication</u>
Preliminary Water Quality Control Study, Steamboat Springs Area	Draft only	June 1966
Preliminary Water Quality Control Study, Upper San Juan River Area	Draft only	June 1966
Preliminary Water Quality Control Study, Effects of Evaporation and Phreatophyte Control Study	Draft only	June 1966
Preliminary Water Quality Control Study, Effects of Out of Basin Diversions and Importations	Draft only	June 1966
Preliminary Water Quality Control Study, Effects and Use of Desalinization in the Basin	Draft only	June 1966
Assessment of Pollution Benefits in the Lower Main Stem Sub-Basin	Draft only	June 1966
Assessment of Pollution Benefits in Southern California	Draft only	June 1966
Assessment of Pollution Benefits in the Gila Sub-Basin	Draft only	June 1966
Radioactivity of Crops and Soils on Selected Farms in the Colorado River Basin	Final draft	May 1965
Radium Monitoring Network - Data Release No. 7	Final Draft	July 1965
Radioactivity in Colorado River Basin Surface Waters, Radiological Health Data	Final Draft	Oct. 1965

Reports Distributed but not Published

Date of Report

Summary of Activities in the Colorado River Basin in the Fields of Salinity Control and Irrigation Water Quality	Oct. 1964
Colorado River Basin Water Quality Control Project Support Statement	Oct. 1964

Water Supply and/or Pollution Control Reports

The Project provides technical and review assistance to the Water Quality Studies Section, Division of Water Supply and Pollution Control, Region VIII. The development of completed reports is a responsibility of that section for all construction agency projects in the Colorado River Basin. During the past year some Project time was devoted to such reports but was minimal.

DEPARTURE FROM 1965 PLANS

During the past year the one characteristic which can describe the Colorado River Basin Project is -- change. This is perhaps best reflected in the staff changes during this period. A change in Project Director, Deputy Project Director, Field Station Chief, and the acquisition of a Chief of the Pollution Control Section were the most significant examples. Actually, a total of 13 new faces were added to the Project. On the other hand, three staff members in the Biology and Organics Laboratory Sections were transferred or took positions in sister agencies in the Government; three others of the Denver staff were reassigned to positions in the Division; while normal attrition claimed four people through resignations. This reflected a net personnel increase to the FY 1965 Project program of six people.

Recruitment problems were significant. The Project lost an excellent prospect for the staff economist position due in large part to the lengthy time required to classify his grade. Personnel freezes were constant companions to the Project. Starting in September, the Project's recruiting efforts were hamstrung by successive personnel ceilings imposed as the result of section 206 of the 1965 DHEW Appropriations Act, the Division Civil Service freeze in January and the Commissioned Officer freeze in February. Despite these formidable obstacles, the Project was successful in bringing on duty four engineers and a staff economist during this period.

Project plans were altered considerably. A terminal date for the submission of the Project final report on salinity pollution was set for December 31, 1966. This tight schedule is subject to modification due to delays such as described later in this section.

A decision was made to concentrate damage evaluation by the Pollution Control Benefits Section on those existing and potential water-use areas of greatest impact, specifically -- southern California, southern Nevada, and central Arizona. An immediate shift to evaluate damages to southern California - the area of greatest potential - was made early in the fiscal year. This necessitated deferring completion of the assessment program for the Lower Main Stem, which is 75 percent complete.

The Pollution Control Section modified its program to operate throughout the Basin without regard to sub-basin boundaries. Specifically, the section is concentrating effort on those significant natural sources of saline pollution having feasible control potential.

The acceleration of the overall Project program and the decision to concentrate on the interstate waters of the Colorado River and its tributaries effected dramatic changes in field activities. The Gila and Little Colorado River Sub-Basins are primarily intrastate systems, neither contributing significant flows to the Colorado River Main Stem from the major portions of the respective sub-basins. No major field sampling operations are now scheduled for either of these basins.

The field activities are currently operating in the entire Upper Basin instead of on a sub-basin by sub-basin basis as originally planned. Field work is now planned to be completed by December 1965.

Equipment delays have plagued the Project field program. Ten conductivity meters ordered from the Industrial Instruments Company, Cedar Grove, New Jersey, in June 1963 were received during June 1964. Field checks revealed major problems due to malfunctions and design characteristics in

the units which could not be reconciled. The equipment was returned to the manufacturer, who has since made extensive adjustments and modifications to the equipment. The units are currently being laboratory tested by Project and SEC personnel.

With the emphasis in field operations shifted to the Upper Basin, the decision was made to assign field personnel to a Depot in Grand Junction, Colorado. This has been accomplished. Concurrently, the decision has also been made and is being implemented to close the Phoenix Field Station by the end of FY 1965. All personnel will be transferred to Project Headquarters in Denver. The Phoenix personnel will staff the Field Studies and Evaluations Section.

The hypothesis proposed by the Economic Contractor as the end-point analysis merging engineering and economic components through adjustment of gross regional product net of water cost was modified. The analyses as presently conceived would be a series of alternative programs involving:

- a) benefit-cost analyses of pollution sources which can be feasibly controlled within the Colorado River Basin, b) benefit-cost analyses with respect to alternative degrees of treatment of supplies to major water users, and
- c) the incremental benefits which can be assessed to quality improvement of the Colorado River due to water imported into the Basin.

The passage of the 1965 DHEW Appropriations Act produced unforeseen demands on staff time. The restrictions imposed by section 206 of that Act required essential shut-down of Project field and analytical operations having any bearing on salinity or irrigation water quality during September and October. A major effort by the Project staff was required during the period from September through December to satisfy the needs of the President's Science Advisory Committee.

Questionnaires for use by the Economic Contractor and the Pollution Control Benefits Section were submitted to Washington in May 1964. At this writing these necessary forms have not been ruled on by the Bureau of the Budget. All programmed Project operations with respect to the collection of uniform data from non-Federal sources cannot be performed. Major alterations to Project program will be required if the questionnaires are not available immediately.

The Program Review last year eliminated Biology and Organic Laboratory operations. The organics group was working on pesticides problems in the Colorado River Basin. The Fifth Session of the Conference held in May brought out recommendations by the Conferees to evaluate possible interstate pesticide pollution problems. The Project called on biological expertise at SEC to survey the Basin to determine overall interstate pesticide pollution sampling needs. Currently, the Project is working with the Pesticides Surveillance Section of the U. S. Bureau of Sports Fisheries and Wildlife to identify specific problem areas and to determine data needs.

PLANS AND SCHEDULES FOR FY 1966

Activities and Accomplishments

The Project schedule for FY 1966 reflects progress. Field work in the Basin will be completed; damages assessed for the major Colorado River water use areas; preliminary feasible control programs for significant pollution sources will be developed; the merging of the engineering-economic factors will be underway; and the final report will be in preparation.

Briefly, the activities of the various sections can be described as follows:

Pollution Control Benefits Section - During the first half of fiscal year 1966 we expect to complete the calculation of present and future economic effects of salinity and hardness in the southern California water service area, and to begin the evaluation of benefits of proposed salinity control measures both in that area and in the Lower Main Stem Sub- Basin of the Colorado River. The latter work will be done in cooperation with the Pollution Control Section. We shall also develop water quality bases for the salinity damage assessment in the Gila Basin and in the three sub-basins of the river above Lee Ferry, commencing about November 1965. During the second half of fiscal year 1966 field data surveys will be carried out in the Upper Colorado River Basins. Estimates will be made of salinity effects in the Gila Basin consequent upon the interstate importation of water by the Central Arizona Project.

Pollution Control Section - Preliminary plans for feasible methods of control for all significant salinity sources will be prepared and completed by the end of FY 1966. Significant inroads in the preparation of definite plans will be made for the most important sources of pollution and those sources, if not the most

significant, for which the most feasible methods of control are possible. Reports on the effects of phreatophytes and other natural consumptive elements as well as evaporation and out-of-basin diversions will be prepared during FY 1966.

The reduction in concentration of salinity and the control cost figures for the various pollution sources and/or treatment methods developed during the coming year will provide an essential input to the engineering-economic analyses, which are basic to the development of recommendations for the alternative programs for water quality control in the Basin.

Field Studies and Evaluation Section - All field activities in the Green, San Juan, and Upper Main Stem Sub-Basins will be completed during the first half of FY 1966. The Grand Junction depot will be phased out with certain professional and technical personnel transferred to Project headquarters in Denver, Colorado at the end of December 1965. The second half of the fiscal year will be devoted primarily to final analysis and evaluation of data collected in the Upper Colorado River Basin and the preparation of preliminary reports covering field station activities.

Radiological Surveillance Section - Fiscal Year 1966 Radiological Surveillance activities will be essentially identical to FY 1965, with continuation of the water, sediment, and effluent surveillance programs. Further investigations into the effect of abandoned uranium mill tailings piles on stream quality, both radiological and chemical, may be necessary, depending upon the conclusions derived from current investigations. Stream biota and crop studies will have been completed. Surveillance data will be transferred to the STORET system. Manpower requirements will remain the same.

Laboratory Services Section - The radiological unit of the Laboratory will continue on the same basis as in FY 1965. The inorganic unit will essentially complete its role with the analysis of final samples from field studies scheduled for late spring of 1966.

Economic Studies - The economic contractor, the University of New Mexico, will require an extension of contract time to June 30, 1966, in order to meet the Project objectives. An analysis of the effect of water quality as a constraint to the Regional economy will be made. An end point analysis requisite to the development of recommendations to the conferees will be made in cooperation with the Project staff. The agricultural segment of the economic study will require further work by the Economic Research Service, USDA, Logan, Utah. The economics section of the Project final report will be underway.

NARRATIVE JUSTIFICATIONFY 1965

Fiscal Year 1965 is the year in which significant gains were made by the Colorado River Basin Water Quality Control Project despite legislative and administrative obstacles. Field studies on pollution source identification were completed for the Lower Colorado River Basin. Field studies on source identification have been initiated in the Upper Colorado River Basin. Damages to significant Colorado River water users in southern California are now being assessed. Work is underway on developing feasible control measures for specific pollution sources. Radioactive pollution is under constant surveillance and such ancillary waste sources as abandoned mill tailings piles and ponds are being evaluated. The economic study has produced the basic tools needed to make realistic analyses with respect to effects on the economy through the imposition of water quantity and quality constraints. The Project is at midpoint in its efforts to date. The state of knowledge of the pollution problems facing the Colorado River are recognizable, but further details must be known to make a realistic appraisal.

FY 1966

The most significant gains in pollution control in the Colorado River Basin will hopefully be made during this year. Field studies in the Basin will be completed. Water use damage assessment will be essentially completed. All significant pollution sources will have been evaluated and definitive control plans started on the most significant contributors. The economic contractors will have finished their basic work and in conjunction with the Project staff initiated evaluation of the pollution control costs and resulting benefits to the economy of the region. This analysis will include consideration of the degrees of treatment required at user diversion points and benefits

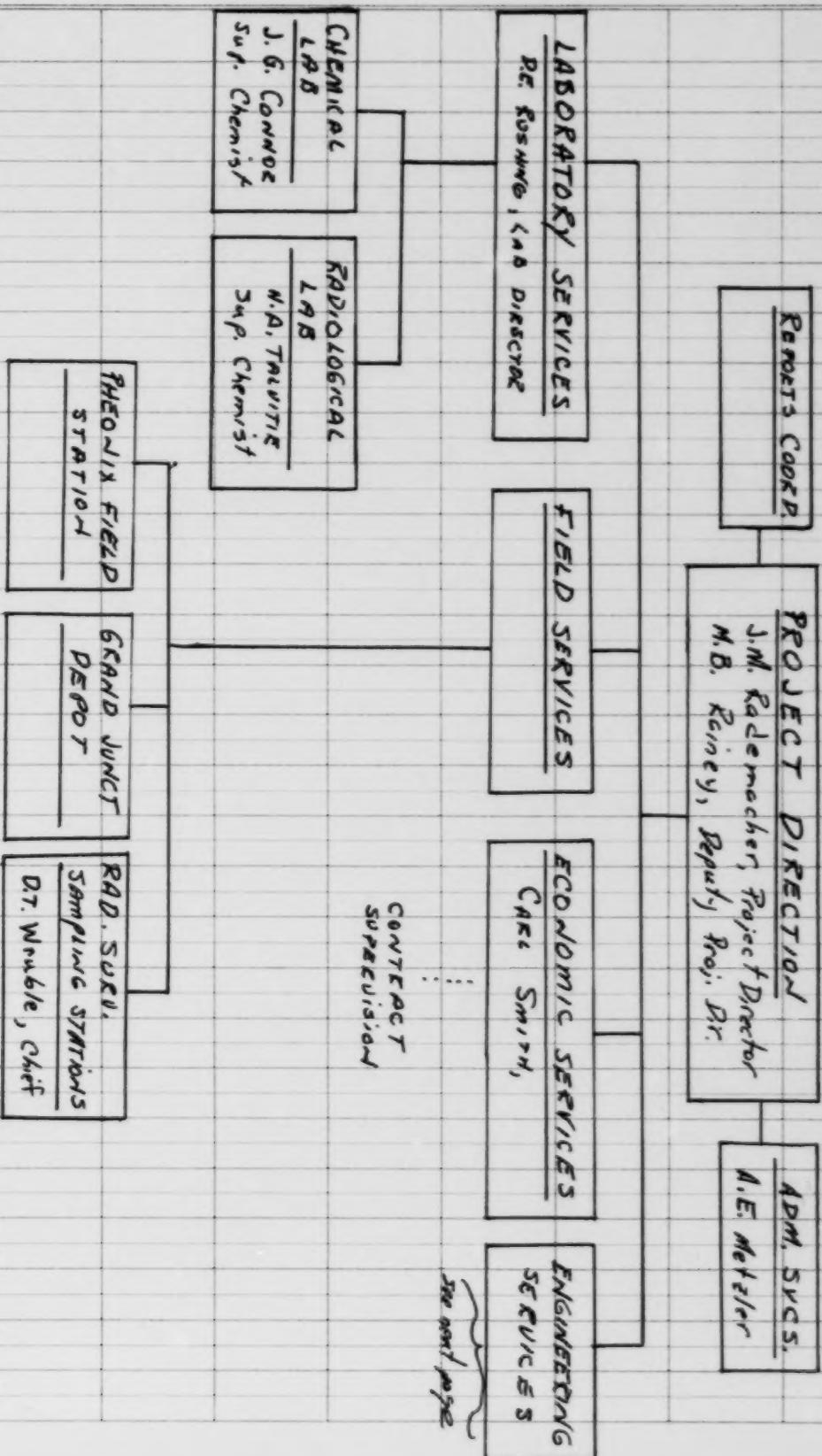
assessed to imported water for water quality control to the Colorado River Basin.

FY 1967

Evaluation of all field and analytical data will be completed during this fiscal year. Recommendations for an effective water pollution control program will be developed for inclusion in the final report to the Enforcement Conference, and is expected to be completed during this year. A phase out of most Project activities will be underway providing no new directives are issued by the Conferees. Subject to comprehensive and other program needs, all staff, except radiological, administrative, field, and laboratory personnel, will have been transferred or released from duty by the end of the fiscal year.

NOTE: A bibliography is included on pages 33 and 34, Project Reports.

**ORGANIZATION
AND
MANAGEMENT**



ENGINEERING
SERVICES

P.J. COFFEE, CHIEF

POLLUTION CONTROL

POLLUTION DAMAGE
ASSESSMENT

G.L. MUMMA

PROJECT PERT DIAGRAM

Please refer to the large folded chart in the special pocket immediately preceding the back cover of this booklet.

RADIOLOGICAL SURVEILLANCE PERT DIAGRAM

Please refer to the large folded chart in the special pocket immediately preceding the back cover of this booklet.

**WORK PROGRAM
FISCAL YEARS 1964
FIELD STATION
COLORADO RIVER BASIN WATER**

ACTIVITIES	SUB-BASIN	Time Schedules and Estimated Man Months																								
		Fiscal Year 1964												Fiscal Year 1965												
		July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July
Over-all Planning, Coordination, and Administration	LMB					6 1/2	5 1/2												2	4						
	GLC									2									1	1						
	UB											1 1/2							10	7						
Statistical Analysis of Existing Water Quality Data	LMB							7	4	1								1	2	1 1/2						
	GLC													1 1/2	1 1/2	1 1/2										
	UB																3	4	1							
Salinity Load Sampling	LMB					13 1/2	5 1/2	1 1/2	2 1/2	1 1/2				2	1	2	1	3 1/2								
	GLC									1 1/2							1 1/2	1 1/2	1 1/2							
	UB												1 1/2				3 1/2	6	1	1	5				3 1/2	
Identification and Evaluation of Salinity Sources	LMB					1 1/2															1	1 1/2				
	GLC																1 1/2									
	UB																		5 1/2	2	1				5	
Municipal and Industrial	LMB							1	1								1	1 1/2	1 1/2							
	GLC													1 1/2												
	UB																			4	1 1/2	1 1/2	1 1/2		3 1/2	
Irrigation Agriculture	LMB					7 1/2	4	4	1	1 1/2				3	1 1/2	1	1	3								
	GLC																1									
	UB																		9	3	4 1/2	2	3 1/2		7 1/2	
Evaluation of Factors Affecting Salinity Concentration	LMB																		1 1/2							
	GLC																									
	UB																			1 1/2	1 1/2					
Agricultural Consumptive Losses	LMB																		1 1/2							
	GLC																									
	UB																			1						
Precipitation of Salts and Ion Exchange in Impoundments and Streams	LMB					2 1/2	1 1/2	1 1/2	1 1/2									1			1 1/2					
	GLC																									
	UB																				1	1 1/2				
Analysis of Current Water Quality Data	LMB							1 1/2									1	4 1/2	1 1/2							
	GLC																		1 1/2							
	UB																			1	3	2				
Preparation of Reports	LMB																									
	GLC																									
	UB																									
Total All Activities	LMB					39 1/2	15	5 1/2	10	1								12 1/2	10 1/2	2	7 1/2	6 1/2				
	GLC									4								5 1/2	1	1 1/2	1 1/2					
	UB											2						39 1/2	16 1/2	7 1/2	15	9				

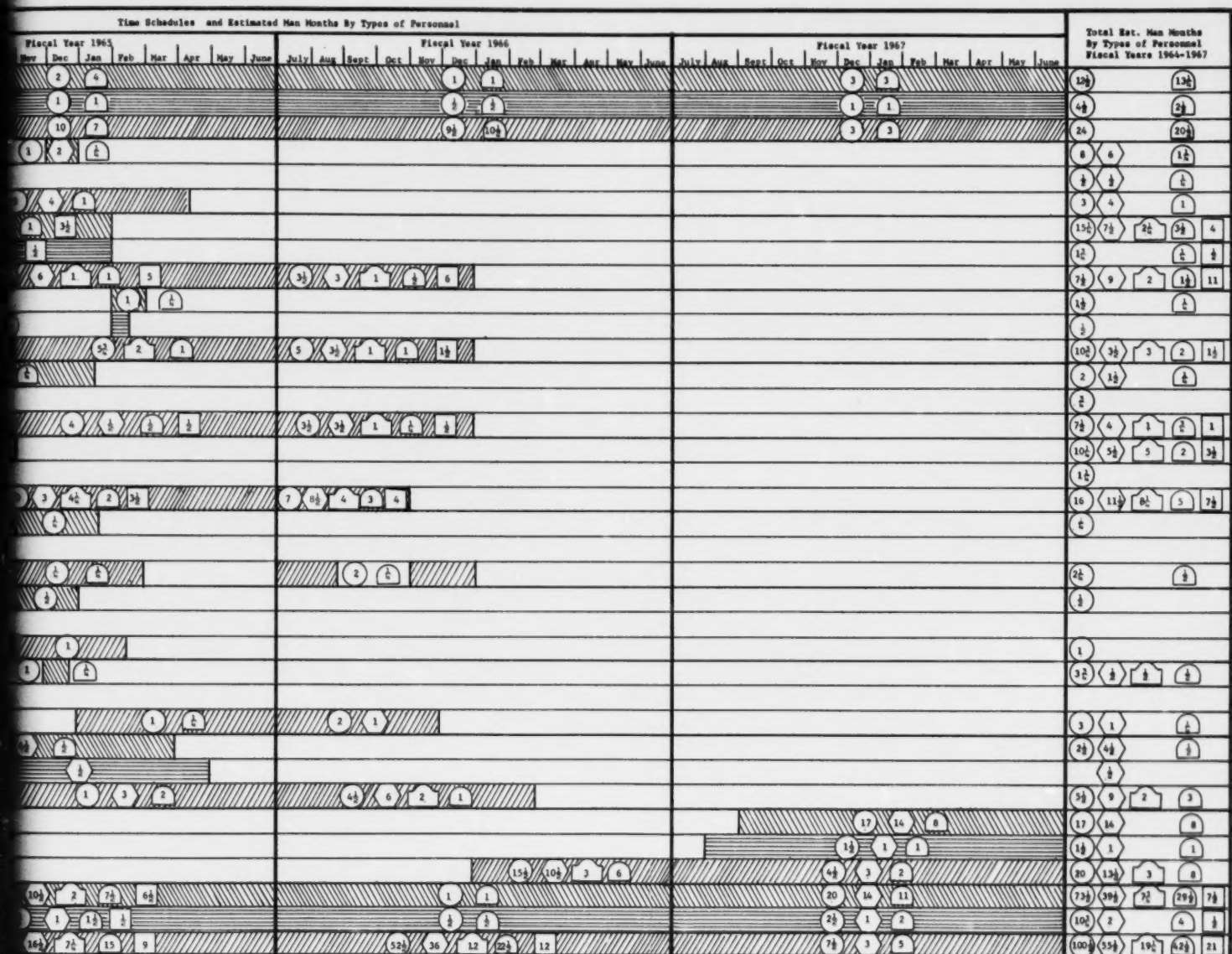
LEGEND

Sub-Basins Est. Man Months

LMB GLC UB	Lower Main Stem Gila & Little Colorado Upper Basin
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Note: Upper Basin Includes Green, Upper Main Stem, and San Juan Sub-Basins

WORK PROGRAMING FISCAL YEARS 1964-1967 FIELD STATION COLORADO RIVER BASIN WATER QUALITY CONTROL PROJECT



LEGEND

Sub-Basins

- LMB Lower Main Stem
- GLC Gila & Little Colorado
- UB Upper Basin

Note: Upper Basin Includes Green, Upper Main Stem, and San Juan Sub-Basins

Est. Man Months By Types of Personnel

- 1 Engineer
- 1 Engineering Technician
- 1 Laboratory Mechanic
- 1 Aquatic Sampler
- 1 Clerk-Stenographer

WORK PROGRAM
FISCAL YEARS 1964-1965
POLLUTION CONTROL
COLORADO RIVER BASIN WATER

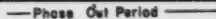
ACTIVITIES	Fiscal Year 1964												Fiscal Year 1965												
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July
INVENTORY																									
1 - Location of Sources																									
2 - Identification of Sources																									
3 - Magnitude of Sources																									
SALINITY CONTROL STUDIES																									
1 - Control Methods Evaluation																									
2 - Construction Cost																									
3 - Cost of Control Curves																									
Specific Studies																									
Paradox Valley																									
La Verkin Springs																									
Dotsero and Glenwood Springs																									
Blue Springs																									
Meeker Spring																									
Steamboat Springs																									
East San Juan River																									
Municipal & Industrial																									
Tailing Piles																									
FUTURE CONDITIONS																									
1 - Economic Projection																									
2 - Benefit Cost Ratios																									
3 - Other Future Conditions																									
OTHER CONCENTRATION SOURCES																									
REVISIONS																									
REPORTS																									
TOTAL ALL ACTIVITIES																									

LEGEND
 Estimated Man Month by Type
 [1] Hydrologist
 [1] Sanitary Engineer
 [1] Geologist

FISCAL YEARS 1964-1967

POLLUTION CONTROL SECTION

PRADO RIVER BASIN WATER QUALITY CONTROL PROJECT



LEGEND

Estimated Man Month by Type of Personnel

- | | | | |
|---|-------------------|---|----------------|
|  | Hydrologist |  | Civil Engineer |
|  | Sanitary Engineer |  | Technician |
|  | Geologist |  | Typist |

WORK PRO
FISCAL YEARS
POLLUTION CONTROL BE
COLORADO RIVER BASIN WATER

[illegible]

LEGEND

Sub-Baseline

Ref. 10

LMS		Lower Main Stem
SC		Southern California
GLC		Gila & Little Colorado
UB		Upper Basin

Note: Upper Basin Includes Green,
Upper Main Stem, and San
Juan Sub-Basins

FISCAL YEARS 1964-1967

POLLUTION CONTROL BENEFITS SECTION

PRADO RIVER BASIN WATER QUALITY CONTROL PROJECT

[illegible]

LEGEND

Sub-Header 100

Est. Man Months By Types of Personnel

1463

 Lower Main Stem

82

Southern California

GLC

Gila & Little Colorado

1994

 Upper Basin

Note: Upper Basin Includes Green,
Upper Main Stem, and San
Juan Sub-Basins

① Engineer

① Clerk-Stenographer

Personnel Utilization - Field Station
Colorado River Basin Water Quality Control Project
Fiscal Years 1965-1967

Activities	Fiscal Year 1965	Fiscal Year 1966	Fiscal Year 1967
Over-all Planning, Coordination, and Administration	Ratnov, San. Engr., GS-14 - 8 mo. Blackman, SASE - 3 mo. Reed, SE - $\frac{1}{2}$ mo. Rouse, SASE - 1 mo. Todd, ASE - $\frac{1}{2}$ mo. Shiele, Clerk-Steno., GS-5 - 12 mo.	Blackman, SE - 9 mo. Rouse, SASE - 1 mo. Todd, SASE - 1 mo. Clerk-Steno., GS-4 - 12 mo.	Blackman, SE - 7 mo. Leman, Clerk-Steno., GS-4 - 1 mo.
Statistical Analysis of Existing Water Quality Data	Blackman, SASE - $2\frac{1}{2}$ mo. Schilling, ASE - 2 mo. Shafer, Engr. Tech., GS-7 - 6 $\frac{1}{2}$ mo. Leman, Clerk-Steno., GS-4 - $1\frac{1}{2}$ mo.		
Salinity Load Sampling	Reed, SE - $1\frac{1}{2}$ mo. Blackman, SASE - $3\frac{1}{2}$ mo. Todd, ASE - 1 mo. Shafer, Engr. Tech., GS-7 - $1\frac{1}{2}$ mo. Korolevich, Engr. Tech., GS-7 - 6 $\frac{1}{2}$ mo. Woeltje, Lab. Mech., GS-7 - 2 mo. Hall, Aq. Sampler, WP-4 - 7 mo. Leman, Clerk-Steno., GS-4 - 2 mo.	Blackman, SE - $\frac{1}{2}$ mo. Todd, SASE - 2 mo. Shafer, Engr. Tech., GS-7 - 1 mo. Korolevich, Engr. Tech., GS-7 - 2 mo. Woeltje, Lab. Mech., GS-7 - 1 mo. Hall, Aq. Sampler, WP-4 - 3 mo. Leman, Clerk-Steno., GS-4 - $\frac{3}{2}$ mo.	
Identification and Evaluation of Salinity Sources	Rouse, SASE - 6 mo. Blackman, SASE - $\frac{1}{2}$ mo. ASE - 1 mo. Woeltje, Lab. Mech., GS-7 - 2 mo. Leman, Clerk-Steno., GS-4 - $1\frac{1}{2}$ mo.	Rouse, SASE - 3 mo. Todd, ASE - 1 mo. Shafer, Engr. Tech., GS-7 - $\frac{1}{2}$ mo. Korolevich, Engr. Tech., GS-5 - 2 mo. Woeltje, Lab. Mech., GS-7 - 1 mo. Hall, Aq. Sampler, WP-4 - $1\frac{1}{2}$ mo. Leman, Clerk-Steno., GS-4 - 1 mo.	
Natural			
Municipal and Industrial	Blackman, SASE - $2\frac{1}{2}$ mo. Schilling, ASE - $1\frac{1}{2}$ mo. Rouse, SASE - 1 mo. Korolevich, Engr. Tech., GS-7 - 1 mo. Hall, Aq. Sampler, WP-4 - $\frac{3}{2}$ mo. Leman, Clerk-Steno., GS-4 - $\frac{1}{2}$ mo.	Schilling, SASE - 2 mo. Rouse, SASE - $\frac{1}{2}$ mo. Todd, ASE - $\frac{1}{2}$ mo. Shafer, Engr. Tech., GS-7 - $\frac{1}{2}$ mo. Korolevich, Engr. Tech., GS-5 - 2 mo. Woeltje, Lab. Mech., GS-7 - 1 mo. Leman, Clerk-Steno., GS-4 - $\frac{1}{2}$ mo.	
Irrigation Agriculture	Todd, ASE - 9 mo. Rouse, SASE - 1 mo. Korolevich, Engr. Tech., GS-7 - $4\frac{1}{2}$ mo. Woeltje, Lab. Mech., GS-7 - $\frac{1}{2}$ mo. Hall, Aq. Sampler, WP-4 - $4\frac{1}{2}$ mo. Leman, Clerk-Steno., GS-4 - 3 mo.	Todd, SASE - 4 mo. Rouse, SASE - 1 mo. Shafer, Engr. Tech., GS-7 - $\frac{1}{2}$ mo. Korolevich, Engr. Tech., GS-5 - 2 mo. Woeltje, Lab. Mech., GS-7 - 1 mo. Hall, Aq. Sampler, WP-4 - $1\frac{1}{2}$ mo. Leman, Clerk-Steno., GS-4 - 3 mo.	
Evaluation of Factors Affecting Salinity Concentration			
M and I Consumptive Losses	Schilling, ASE - $\frac{1}{2}$ mo. Leman, Clerk-Steno., GS-4 - $\frac{1}{2}$ mo.	Schilling, SASE - 2 mo. Leman, Clerk-Steno., GS-4 - $\frac{1}{2}$ mo.	
Agricultural Consumptive Losses	Todd, ASE - $1\frac{1}{2}$ mo.		

Personnel Utilization
Pollution Control Benefits Section
Colorado River Basin Water Quality Control Project
Fiscal Years 1965-1967

Activities	Fiscal Year 1965	Fiscal Year 1966	Fiscal Year 1967
Basic Water Quality Studies	Coffey, San. Engr. Director 1 mo. Reed, San. Engr. 1 mo. Yorke, SA San. Engr. 1 mo. Yonikas, A San. Engr. 2 mo. Ortolano, A San. Engr. 1/2 mo. Bennett, A San. Engr. 1-1/2 mo. Squires, Clerk-Steno, GS-4 1-1/4 mo.	Coffey, San. Engr. Director 1 mo. Reed, San. Engr. 1 mo. Yonikas, A San. Engr. 1-1/2 mo. Ortolano, A San. Engr. 1 mo. Bennett, A San. Engr. 1-1/2 mo. Squires, Clerk-Steno, GS-4 1 mo.	
Projections of Water Demands	Coffey, San. Engr. Director 2 mo. Reed, San. Engr. 1 mo. Yonikas, A San. Engr. 1 mo. Ortolano, A San. Engr. 2 mo. Bennett, A San. Engr. 1/2 mo. Dawson, SA San. Engr. 2-1/2 mo. Squires, Clerk-Steno, GS-4 1-3/4 mo.		
Projections of Water Quality	Coffey, San. Engr. Director 1 mo. Reed, San. Engr. 1/2 mo. Yorke, SA San. Engr. 1-1/2 mo. Yonikas, A San. Engr. 1-1/2 mo. Bennett, A San. Engr. 1 mo. Squires, Clerk-Steno, GS-4 1 mo.	Coffey, San. Engr. Director 1 mo. Reed, San. Engr. 2 mo. Yorke, SA San. Engr. 1-1/2 mo. Yonikas, A San. Engr. 1-1/2 mo. Bennett, A San. Engr. 1 mo. Squires, Clerk-Steno, GS-4 1 mo.	
Field Data Surveys	Coffey, San. Engr. Director 2 mo. Reed, San. Engr. 2 mo. Yorke, SA San. Engr. 3 mo. Yonikas, A San. Engr. 2-1/2 mo. Ortolano, A San. Engr. 1-1/2 mo. Squires, Clerk-Steno, GS-4 2 mo.	Coffey, San. Engr. Director 1 mo. Reed, San. Engr. 2 mo. Yorke, SA San. Engr. 2 mo. Yonikas, A San. Engr. 1-1/2 mo. Ortolano, A San. Engr. 2 mo. Bennett, A San. Engr. 2-1/2 mo. Squires, Clerk-Steno, GS-4 1-3/4 mo.	
Economics of Water Quality	Coffey, San. Engr. Director 1-1/2 mo. Reed, San. Engr. 1 mo. Yorke, SA San. Engr. 1 mo. Yonikas, A San. Engr. 1 mo. Ortolano, A San. Engr. 1 mo. Bennett, A San. Engr. 1/2 mo. Squires, Clerk-Steno, GS-4 1 mo.	Coffey, San. Engr. Director 1-1/2 mo. Reed, San. Engr. 1-1/2 mo. Yorke, SA San. Engr. 2 mo. Yonikas, A San. Engr. 1-1/2 mo. Ortolano, A San. Engr. 2 mo. Bennett, A San. Engr. 1-1/2 mo. Squires, Clerk-Steno, GS-4 1-3/4 mo.	Coffey, San. Engr. Director 1 mo. Reed, San. Engr. 1/2 mo. Yonikas, A San. Engr. 1/2 mo. Squires, Clerk-Steno, GS-4 1/4 mo.
Estimation of Pollution Control Benefits	Coffey, San. Engr. Director 3 mo. Reed, San. Engr. 3 mo. Yorke, SA San. Engr. 4 mo. Yonikas, A San. Engr. 3 mo. Ortolano, A San. Engr. 2 mo. Bennett, A San. Engr. 1-1/2 mo. Heaney, A San. Engr. 2-1/2 mo. Squires, Clerk-Steno, GS-4 3-3/4 mo.	Coffey, San. Engr. Director 2 mo. Reed, San. Engr. 3 mo. Yorke, SA San. Engr. 3 mo. Yonikas, A San. Engr. 2-1/2 mo. Ortolano, A San. Engr. 3 mo. Bennett, A San. Engr. 3-1/2 mo. Squires, Clerk-Steno, GS-4 2-3/4 mo.	Coffey, San. Engr. Director 1 mo. Reed, San. Engr. 1 mo. Yorke, SA San. Engr. 2 mo. Yonikas, A San. Engr. 2 mo. Ortolano, A San. Engr. 1 mo. Bennett, A San. Engr. 1-1/2 mo. Squires, Clerk-Steno, GS-4 1-1/2 mo.

Projections of Water Quality	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	1 mo. 2 mo. 1/2 mo. 1-1/2 mo. 1 mo. 1 mo.	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	1 mo. 2 mo. 1/2 mo. 1-1/2 mo. 1 mo. 1 mo.
Field Data Surveys	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	2 mo. 2 mo. 3 mo. 2-1/2 mo. 1-1/2 mo. 2 mo.	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	1 mo. 2 mo. 2 mo. 1-1/2 mo. 2 mo. 2-1/2 mo. 1-3/4 mo.
Economics of Water Quality	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	1-1/2 mo. 1 mo. 1 mo. 1 mo. 1/2 mo. 1 mo.	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	1-1/2 mo. 1-1/2 mo. 2 mo. 1-1/2 mo. 2 mo. 1-1/2 mo. 1-3/4 mo.
Estimation of Pollution Control Benefits	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Heaney, A San. Engr. Squires, Clerk-Steno, GS-4	3 mo. 3 mo. 4 mo. 3 mo. 2 mo. 1-1/2 mo. 2-1/2 mo. 3-3/4 mo.	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	2 mo. 3 mo. 3 mo. 2-1/2 mo. 3 mo. 3-1/2 mo. 2-3/4 mo.
Evaluation of Effects of Pollution Control	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	3 mo. 1 mo. 3 mo. 2-1/2 mo. 1-1/2 mo. 1-1/2 mo.	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	3 mo. 1 mo. 3 mo. 2-1/2 mo. 3 mo. 1-1/2 mo. 2-1/4 mo.
Preparation of Reports	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	1-1/2 mo. 1 mo. 1-1/2 mo. 1 mo. 2 mo. 1/2 mo. 1-1/4 mo.	Coffey, San. Engr. Director Reed, San. Engr. Yorke, SA San. Engr. Yonikas, A San. Engr. Ortolano, A San. Engr. Bennett, A San. Engr. Squires, Clerk-Steno, GS-4	2-1/2 mo. 1-1/2 mo. 1-1/2 mo. 1 mo. 1 mo. 1/2 mo. 1-1/2 mo.

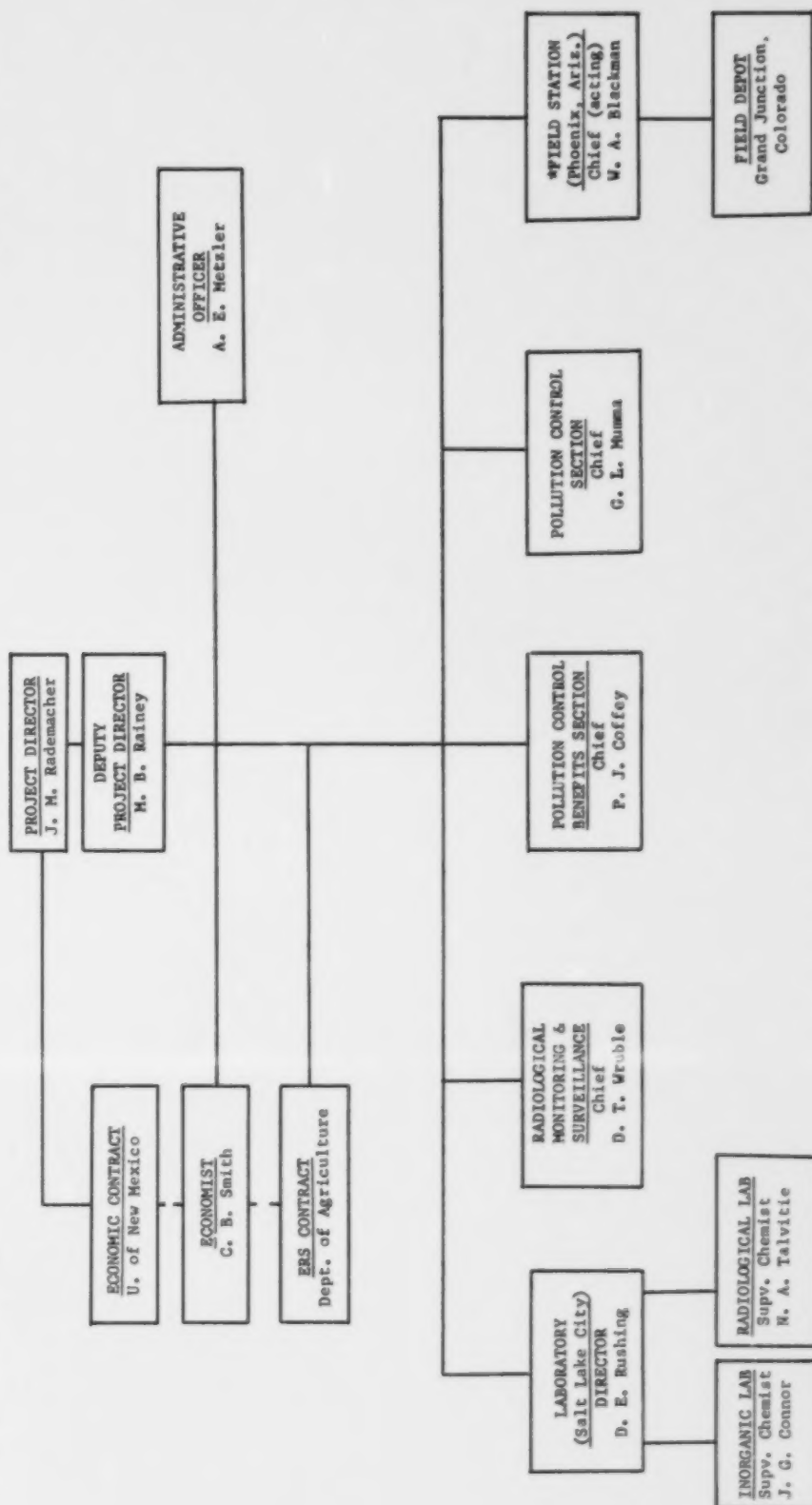
Note: Possible replacement of some personnel may be necessary in FY 1966, but for clarity present staff members are shown.

March 1, 1965

ORGANIZATION CHART

Region VIII, Denver, Colorado

COLORADO RIVER BASIN PROJECT



*Field Station at Phoenix to be closed 6/30/65.
Personnel to transfer to Denver and unit will
operate as Field Data Evaluation Section.

FUNCTIONAL STATEMENTCOLORADO RIVER BASIN WATER QUALITY CONTROL PROJECT
(Enforcement)

1. Determines the location, magnitude, and the causes of interstate pollution of the waters of the Colorado River and its tributaries.
2. Determines and evaluates the nature and magnitude of the damages to water users caused by this pollution.
3. Determines and evaluates methods of controlling or minimizing pollution of the waters of the Colorado River and its tributaries.
4. Justifies control measures or approaches through an evaluation of the economic benefits which will accrue from the reduction of pollutant concentrations to various levels in the Colorado River and its tributaries.

THE OFFICE OF THE PROJECT DIRECTOR

1. Interprets Division policy in order to establish Project objectives.
2. Formulates plans and guidelines for the accomplishment of these objectives.
3. Directs and administers Project activities.
4. Plans and develops necessary contractual arrangements. The Project Director serves as the Project Officer in the contract with the University of New Mexico's Department of Economics. He coordinates the efforts of this group of economists and the Economics Research Service of the U. S. Department of Agriculture, (under contract for services through a memo of understanding), with the engineering requirements of the Project.

5. Reports on Project accomplishments.
6. Represents the Project in relationships with public and private entities.
7. Plans the Project's personnel and fiscal requirements.

THE OFFICE OF ADMINISTRATIVE MANAGEMENT

1. Interprets policy and establishes administrative procedures for the operation and management of the Project.
2. Procures and manages space, equipment, supplies and services for the Project.
3. Plans and manages the Project's fiscal affairs.
4. Maintains unofficial commitment register.
5. Provides the Project with personnel management.

THE POLLUTION CONTROL BENEFITS SECTION

1. Conducts field investigations and research necessary to collect data which will be used to perform the following assignments:
 - a. Develops a water use inventory of the Colorado River and its tributaries.
 - b. Determines the type of damage or impairment associated with each legitimate water use due to pollution.
 - c. Evaluates the degree of damage associated with existing and future estimated salinity levels.
 - d. Develops water use projections for agriculture, industry, domestic and other in the Colorado River Basin and its significant tributary areas.
2. Develops the user-cost relationships to varying salinity concentrations.
3. Prepares reports of findings for inclusion in the Project documents.

THE POLLUTION CONTROL SECTION

1. Conducts field investigations and analyses in a coordinated effort with the Field Studies and Evaluation Section (Phoenix) to collect data which will be used as a basis for Project recommendations:
 - a. Develops a waste source inventory of the Colorado River and its tributaries.
 - b. Evaluates significant sources of saline pollution and determines control feasibility.
2. Develops the control cost relationship to varying salinity concentrations.
3. Provides expertise in ground water hydro-geology and surface water hydrology.
4. Prepares reports of findings for inclusion in Project documents.

FIELD STUDIES AND EVALUATION SECTION (Phoenix Field Station)

1. Analyzes existing data for patterns of salinity buildup in relation to time and distance.
2. Provides field engineering services to the Project.
3. Designs and implements field inventory, measurements, and sampling programs in all regular and special subject areas for the salinity program.
4. Provides expertise in statistical evaluations, and agricultural and irrigation engineering.
5. Maintains liaison with agencies interested in the measurement of water quality and with other public and private entities in the Colorado River Basin.

6. Analyzes collected data and submits reports to the Pollution Control Benefits and Pollution Control Sections.
7. Prepares reports of findings for inclusion in Project documents.

THE RADIOLOGICAL SURVEILLANCE SECTION (Denver)

1. Determines on a continuing basis the degree of radiological pollution of the Basin waters due to uranium mining and milling operations.
2. Provides an estimate of the degree of pollution from fallout due to worldwide nuclear weapons tests.
3. Determines distribution of radioactivity in river, lake or reservoir bottom sediments through a basinwide sediment survey.
4. Evaluates the radiological pollutional effects of residual contamination from uranium mill tailings piles.
5. Evaluates phosphate fertilizers used in the farming areas of the Colorado Basin as a possible source of radium-226 in crops.
6. Obtains samples through a radiological monitoring network for analyses by the Laboratory Section.
7. Prepares reports of findings for inclusion in Project documents.

THE LABORATORY SERVICES SECTION (Salt Lake City)

1. Provides laboratory support in radiochemistry, inorganic chemistry and related sanitary sciences at the Salt Lake City location and in the field.
2. Analyzes samples collected by the Field Station and the Radiological Monitoring Network.
3. Reviews results of collected data and prepares reports of chemical findings.

4. Develops appropriate laboratory procedures for accomplishment of Project objectives.
5. Prepares reports on methods of analysis, maintains records of analyses and receipts of sample acceptance.
6. Determines and performs acceptable controls for evaluation of laboratory accuracy.

**BUDGET
AND
PERSONNEL**

STAFFING ROSTER
COLORADO RIVER BASIN PROJECT

Filled Permanent Positions: 1965-48; 1966-48

Unit & Position Title	Grade or Rank	Series	Position Number	Duty Station	Incumbent	Year of EOD	Year of Termination	Remarks
PROJECT HEADQUARTERS								
PROJECT DIRECTION								
Project Director (Supv. San Eng)	GS-15/SE DIR	819	---	Denver, Colo.	Rademacher, John M.	1964		
Deputy Project Dir. (Supv. San Eng)	GS-14	819	EH-63-553	Denver, Colo.	Rainey, M. B.	1964		Trans Phnx to Den 3/1/65
Administrative Officer	GS-11	341	---	Denver, Colo.	Metzler, A. E.	1964		Plan prom to GS-11 6/1/65
Economist	GS-13	110	BSS-6178	Denver, Colo.	Smith, Carl	1965		
Secretary-Steno	GS-5	318	161	Denver, Colo.	Pearson, Donna	1960		
Secretary-Steno	GS-5	318	---	Denver, Colo.	Shedden, Evelyn	1961		Plan prom to GS-5 4/15/65
POLLUTION CONTROL BENEFITS								
Chief (Supv. San Eng)	GS-14/SE DIR	819	---	Denver, Colo.	Coffey, Philip J.	1963		
Asst. Chief (San Eng)	GS-12/SE	819	---	Denver, Colo.	Reed, Lloyd A.	1961		
Sanitary Engineer	GS-11/SASE	819	---	Denver, Colo.	Yorke, C. A.	1964		
Sanitary Engineer	GS-9 /ASE	819	---	Denver, Colo.	Yonikas, P. J.	1964		
Sanitary Engineer	GS-9 /ASE	819	---	Denver, Colo.	Ortolano, L.	1965		EOD 1/1/65
Sanitary Engineer	GS-9 /ASE	819	---	Denver, Colo.	Bennett, Francis	1965		EOD 2/15/65
Clerk-Steno	GS-4	312	256	Denver, Colo.	Squires, Marjorie	1964		
POLLUTION CONTROL								
Chief (Hydrologist)	GS-14	1315	EH-64-34	Denver, Colo.	Muma, G. L.	1964		
Asst. Chief (San Eng)	GS-13/SSE	819	---	Denver, Colo.	Jeffrey, E. A.	1964		
Geologist	GS-12	1350	BSS-5179	Denver, Colo.	Spiegel, Sidney J.	1962		
Geohydrologist	GS-9	1315	EH-63-492	Denver, Colo.	Baez, Cesar	1964		
Sanitary Engineer	GS-11/SASE	819	---	Denver, Colo.	Vacant	1965		Plan prom fr GS-7 4/15/65
Engineering Technician	GS-7	802	235	Denver, Colo.	Vacant	1965		Est. EOD 6/1/65
Clerk-Steno	GS-4	322	215	Denver, Colo.	Spedon, Mary	1962		Est. EOD 6/1/65repl Baez
RADIOLOGICAL SURVEILLANCE								
Chief (San Eng)	GS-11/SASE	819	---	Denver, Colo.	Wruble, D. T.	1964		Plan prom to GS-4 7/1/65
Engineering Technician	GS-5	802	171	Denver, Colo.	Vacant	1965		Est. EOD 6/1/65
PHOENIX FIELD STATION 1/								
Chief (San Eng)	GS-12/SE	819	---	Phoenix, Arizona	Blackman, William C.	1964		Plan promotion to SE 7/1/65
Asst. Chief (San Eng)	GS-11/SASE	819	---	Phoenix, Arizona	Rouse, J. V.	1964		
Sanitary Engineer	GS-9/ASE	819	---	Phoenix, Arizona	Schilling, George R.	1964	1966	
Engineering Technician	GS-7	802	EH-64-393	Phoenix, Arizona	Shafer, William	1964		
Laboratory Mechanic	GS-7	1610	EH-64-316	Phoenix, Arizona	Woeltje, Donald	1964		
Secretary-Steno	GS-5	318	64-21	Phoenix, Arizona	Shiels, Louise	1964		

1/ Phoenix Field Station to be closed 6/65. Personnel transferred to Denver.

Unit & Position Title	Grade or Rank	Series	Position Number	Duty Station	Incumbent	Year of EOD	Year of Termination	Remarks
<u>PHOENIX FIELD STATION (Cont'd)</u>								
Clerk-Steno	GS-4	312	256	Phoenix, Arizona	Leaman, Virginia	1964		
Sanitary Engineer	GS-9/ASE	819	---	Grand Junction, Colo.	Todd, Alan W.	1964		
Engineering Technician	GS-7	802	EH-64-392	Grand Junction, Colo.	Korolevich, Eugene R.	1961		
Aquatic Sampler	WB-4	3501	EH-64-21	Grand Junction, Colo.	Hall, Benjamin L.	1964	1966	
Engineering Technician	WB-4	3501	EH-64-21 IA	Grand Junction, Colo.	Vacant	1965	1966	Est. EOD 6/1/65 Temporary
Sanitary Engineer	GS-5	802	EH-64-684	Grand Junction, Colo.	Vacant	1965		Est. EOD 6/1/65
	GS-7/ASE	819	---	Denver, Colorado	Vacant	1965		Est. EOD 6/1/65
<u>SALT LAKE CITY LABORATORY</u>								
<u>LABORATORY DIRECTION</u>								
Laboratory Director	GS-15	1320	BSS-3631	Salt Lake City, Utah	Rushing, David E.	1960		
Administrative Aid	GS-6	301	194	Salt Lake City, Utah	Zeean, Blanche	1961		
Clerk-Steno	GS-4	312	173	Salt Lake City, Utah	Madsen, Janice	1963		
<u>INORGANIC CHEMISTRY LABORATORY</u>								
Supervisory Chemist	GS-13	1320	BSS-4406	Salt Lake City, Utah	Connor, John G.	1961		
Chemist, Analytical	GS-12	1320	EH-64-573	Salt Lake City, Utah	Jarrell, R. E.	1961		
Chemist, Analytical	GS-9	1320	BSS-4410	Salt Lake City, Utah	Keisler, Hans	1962		
Chemist, Analytical	GS-9/AHSO	1320	---	Salt Lake City, Utah	Freking, Ronald J.	1962		
Physical Science Aid	GS-4	1311	205	Salt Lake City, Utah	Griddle, Louise	1965		
<u>RADIOCHEMISTRY LABORATORY</u>								
Supervisory Chemist	GS-13/SHSO	1320	---	Salt Lake City, Utah	Talvitie, Nilo A.	1962		
Chemist, Analytical	GS-11	1320	BSS-4692	Salt Lake City, Utah	Garcia, William J.	1961		
Chemist, Analytical	GS-11	1320	BSS-4692 IA	Salt Lake City, Utah	Demint, Robert J.	1962		
Chemist, Analytical	GS-11	1320	BSS-4692 IA	Salt Lake City, Utah	Clark, Don A.	1960		
Physical Science Technician	GS-5	1311	269	Salt Lake City, Utah	Sorenson, Boyd C.	1964		
Physical Science Aid	GS-4	1311	247	Salt Lake City, Utah	Farmer, Richard J.	1963		

March 1, 1965

PERSONNEL SERVICES REQUEST FOR FY 1965

Region VIII, Denver, Colorado

Colorado River Basin Project

Position Title

Grade or Rank as of 3/1/65

Current Annual Rate as of 6/30/65

F. Y. 1965 Costs Compensation Benefits

Remarks

Permanent Positions

Project Director	Rademacher, J. M.	SEDIR +10	9,040	9,040	8,247	2,661	EOD 7/15/64
Deputy Project Director	Fitzpatrick, J. W.	SEDIR +	-	-	6,590	1,472	Trf. R.O. 2/1/65
Administrative Assistant	Metzler, A. E.	GS-9/1	7,220	8,650	7,364	585	Plan Promote GS-11 6/1/65
Economist	Smith, C.	GS-13/3	12,915	12,915	4,372	345	Est. EOD 3/1/65
Secretary-Steno	Pearson, Donna	GS-5/6	5,825	5,825	5,843	481	
Secretary-Steno	Sneddon, Evelyn	GS-4/4	4,930	5,330	5,085	432	Plan Promote GS-5 4/1/65
Chief, Pollution Control Benefits	Coffey, P. J.	SEDIR +20	11,624	11,624	11,577	2,638	
Asst. Chief, Pollution Control Benefits	Reed, L. A.	SE +8	7,196	7,196	7,015	2,487	
Sanitary Engineer	Yorke, C. A.	SASE +2	4,244	4,244	4,189	2,287	
Sanitary Engineer	Yonikas, P. J.	ASE -2	3,377	3,377	3,332	1,836	
Sanitary Engineer	Ortolano, L.	ASE +3	5,537	5,720	2,798	1,109	EOD 1/1/65
Sanitary Engineer	Bennett, P.	ASE -2	3,377	3,377	1,548	842	OAD 1/15/65
Clerk-Steno	Squires, Marjorie	GS-4/6	5,230	5,230	5,237	400	
Sanitary Engineer	Heaney, J.	ASE +2	-	-	1,509	496	Sep. from Corps 9/18/64
Sanitary Engineer	Dawson, H.	SASE +2	-	-	1,105	485	Trf. Reg. III 9/15/64
Chief, Pollution Control	Muma, G. L.	GS-14/1	14,170	14,660	14,338	1,062	
Asst. Chief, Pollution Control	Jeffrey, E. A.	SSE +18	10,210	10,210	9,754	2,641	
Geologist	Spiegel, S. J.	GS-12/4	11,315	11,315	11,147	842	
Hydrologist	Beer, C.	GS-9/1	7,220	7,220	6,467	525	Plan Promote to pos. 4/15/65
Engineering Technician	Vacant	GS-7/1	-	6,050	512	20	Est. EOD 6/1/65 repl. Baer
Sanitary Engineer	Vacant	SASE +2	-	5,411	451	191	Est. EOD 6/1/65
Clerk-Steno	Spedon, Mary	GS-3/9	5,085	5,085	5,033	425	
Chief, Radiological Surveillance	Wruble, D. T.	SASE +3	5,782	5,782	5,661	2,318	Est. EOD 6/1/65
Engineering Technician	Vacant	GS-5	-	5,000	422	32	
Chief, Phoenix Field Station	Rainey, M. B.	GS-14/4	15,640	15,640	15,694	1,154	Reassigned Dep. Proj. Dir. 3/1/65
Asst. Chief, Phoenix Field Station	Blackman, W. A.	SE +16	7,873	7,873	7,841	2,313	
Sanitary Engineer	Rouse, J. V.	SASE +4	6,397	6,397	4,233	1,731	OAD 10/5/64
Sanitary Engineer	Todd, A. W.	ASE -2	3,377	3,377	3,333	2,135	
Sanitary Engineer	Schillinger, C. R.	SASE +3	5,782	5,782	3,331	1,502	OAD 10/25/64; +3, 4/24/65

March 1, 1965
Colorado River Basin Project

PERSONNEL SERVICES REQUEST FOR FY 1965 (continued)

Region VIII, Denver, Colorado

Position Title	Incumbent	Grade or Rank as of 3/1/65	Current Annual Rate	Annual Rate as of 6/30/65	F. Y. 1965 Compensation	Costs Benefits	Remarks
Permanent Positions							
Engineering Technician	Korolevich, E. R.	GS-7/1	6,050	6,050	6,008	447	
Engineering Technician	Shafer, W. H.	GS-7/1	6,050	6,050	5,994	494	
Engineering Technician	Vacant	GS-5/1	-	5,000	422	32	Est. EOD 6/1/65
Laboratory Mechanic	Burns, J. F.	GS-7/1	-	-	538	21	Resigned 7/23/64
Laboratory Mechanic	Hoeltje, D. R.	GS-7/1	6,050	6,050	4,842	259	
Aquatic Sampler	Hall, B. L.	WB-4/2	5,283	5,283	5,186	289	
Sanitary Engineer	Vacant	ASE -2	-	3,377	281	153	Est. EOD 6/1/65
Clerk-Steno	Leaman, Virginia	GS-4/10	5,830	5,830	5,842	433	
Secretary-Steno	Shields, Virginia	GS-5/1	5,000	5,000	4,822	412	Terminate 6/30/65
Laboratory Director	Rushing, D. E.	GS-15/3	17,600	17,600	17,453	1,274	
Administrative Aid	Zeman, Blanche	GS-6/5	6,245	6,245	6,261	464	
Clerk-Steno	Madsen, Janice	GS-4/2	4,630	4,780	4,664	320	
Supervisory Chemist	Connor, J. G.	GS-13/4	13,335	13,335	13,168	980	
Chemist, Analytical	Jarrell, R. E.	GS-12/3	10,960	10,960	10,703	812	
Chemist, Analytical	Keisler, Hans	GS-9/5*	8,690	8,690	8,725	684	
Chemist, Analytical	Freking, R. J.	AHSO-2	5,410	5,411	4,481	1,997	
Physical Science Aid	Criddle, Louise	GS-4/1	4,480	4,480	3,577	239	EOD 9/9/64
Supervisory Chemist	Talvitie, N. A.	SHSO +20	10,516	10,516	10,398	2,639	
Chemist, Analytical	Garcia, W. J.	GS-11/5*	10,125	10,125	10,169	778	
Chemist, Analytical	Demint, R. J.	GS-11/5*	10,125	10,125	10,169	778	
Chemist, Analytical	Clark, D. A.	GS-11/3*	9,535	9,535	9,456	726	
Physical Science Technician	Sorenson, B. C.	GS-5/1	5,000	5,000	4,686	402	
Physical Science Aid	Farmer, R. J.	GS-4/3	4,780	4,780	4,713	357	
Supervisory Chemist	Henderson, C.	GS-13/5	-	-	1,210	87	Trf. 8/2/64
Chemist, Analytical	Woodward, T.	GS-12/3	-	-	123	-	Trf. Reg. IX 7/5/64
Physical Science Technician	Sawtelie, D.	GS-5/1	-	-	764	47	Resigned 8/14/64
Temporary Position							
Aquatic Sampler		WB-4/1	-	4,139	1,400	84	Est. EOD 3/1/65
					320,083	50,655	370,738 TOTAL

* Shortage Category Salary Rate
Step-in-grade increases included.

March 1, 1965

Region VIII, Denver, Colorado

PERSONNEL SERVICES REQUEST FOR FY 1966

Colorado River Basin Project

Position Title

Incumbent

Grade or
Rank
as of 7/1/65Annual Rate
as of 7/1/65Annual Rate
as of 6/30/66F. Y. 1966 Costs
Compensation Benefits

Remarks

Permanent Positions

Project Director	Rademacher, J.M.	SEDIR +10	9,040	9,040	9,040	2,790	
Deputy Project Director	Rainey, M. E.	GS-14/4	15,640	16,130	15,900	1,167	
Administrative Officer	Metzler, A. E.	GS-11/1	8,650	8,945	8,711	680	
Economist	Smith, Carl	GS-13/3	12,915	13,335	13,108	979	
Secretary-Steno	Pearson, Donna	GS-5/6	5,825	5,990	5,929	486	
Secretary-Steno	Sneddon, Evelyn	GS-5/3	5,330	5,495	5,387	451	
Chief, Pollution Control Benefits	Coffey, P. J.	SEDIR +20	11,624	11,624	11,624	2,790	
Asst. Chief, Pollution Control Benefits	Reed, L. A.	SE +8	7,196	7,196	7,196	2,489	
Sanitary Engineer	Yorke, C. A.	SASE +2	4,244	5,411	5,216	2,309	
Sanitary Engineer	Yonikas, P. J.	ASE -2	3,377	5,411	4,303	1,960	Promotion 10/65 to SASE +;
Sanitary Engineer	Ortolano, L.	SASE +3	5,782	6,397	5,833	2,309	Promotion 7/65 to SASE.
Sanitary Engineer	Bennett, Frank	ASE -2	3,377	3,377	3,377	1,838	
Clerk-Steno	Squires, Marjorie	GS-4/6	5,230	5,380	5,394	452	
Chief, Pollution Control	Mumma, G. L.	GS-14/2	14,660	15,150	14,840	1,096	
Asst. Chief, Pollution Control	Jeffrey, E. A.	SSE +18	10,210	10,210	10,210	2,639	
Geologist	Spiegel, S. J.	GS-12/4	11,315	11,315	11,359	855	
Hydrologist	Raez, C.	GS-9/1	7,220	7,465	7,369	587	
Engineering Technician	Vacant	GS-7/1	6,050	6,250	6,092	500	
Sanitary Engineer	Vacant	SASE +2	5,411	5,411	5,411	453	
Clerk-Steno	Spedon, Mary	GS-3/9	5,085	5,230	5,228	441	Promotion 7/65 to 4/6
Chief, Radiological Surveillance	Wruble, D. T.	SASE +3	5,782	6,397	6,243	2,309	
Engineering Technician	1/Vacant	GS-5/1	5,000	5,165	5,025	428	Est. EOD 6/1/65 1/
Chief, Pollution Identification & Evaluation	Blackman, W. A.	SE +14	7,873	8,856	8,550	2,502	Promotion 7/65 to SE
Asst. Chief, Ident. & Eval.	Rouse, J. V.	SASE +4	6,397	6,397	6,397	2,319	Promotion 7/65 to SASE
Sanitary Engineer	Todd, A. W.	SASE +2	5,411	5,411	5,411	2,310	Terminates 12/31/65
Sanitary Engineer	Schilling, G. R.	SASE +3	5,782	-	2,891	1,137	Trf. to Reg. III 12/31/65
Sanitary Engineer	Vacant	ASE -2	3,377	3,377	3,377	2,137	Est. EOD 6/1/65
Engineering Technician	Koroievich, E.R.	GS-7/1	6,050	6,250	6,248	463	
Engineering Technician	Shafer, W.H.	GS-7/1	6,050	6,250	6,248	502	
Engineering Technician	Vacant	GS-5/1	5,000	5,165	5,025	428	Est. EOD 6/1/65

March 1, 1965
Colorado River Basin Project

PERSONNEL SERVICES REQUEST FOR FY 1966 (continued)

Region VIII, Denver, Colorado

Position Title	Incumbent	Grade or Rank as of 7/1/65	Annual Rate as of 7/1/65	Annual Rate as of 6/30/66	F. Y. 1966 Compensation	Benefits	Remarks
<u>Permanent Positions</u>							
Laboratory Mechanic	Woeltje, D. R.	GS-7/1	6,050	6,250	6,276	282	
Aquatic Sampler	Hall, B. L.	WB-4/2	5,283		2,770	130	Terminates 12/31/65
Clerk-Steno	Leaman, Virginia	GS-4/10	5,830	5,830	5,846	434	
Clerk-Steno	Vacant	GS-4/1	4,480	4,480	4,489	342	Est. EOD 7/1/65 repl. Shields
Laboratory Director	Rushing, D. E.	GS-15/3	17,600	18,170	18,005	1,310	
Administrative Aid	Zeman, Blanche	GS-6/5	6,245	6,430	6,389	472	
Clerk-Steno	Madsen, Janice	GS-4/3	4,780	4,930	4,815	329	
Supervisory Chemist	Connor, J. G.	GS-13/4	13,335	13,335	13,384	994	
Chemist Analytical	Jarrell, R. E.	GS-12/3	10,960	11,315	11,210	846	
Chemist Analytical	Keisler, Hans	GS-9/5*	8,690	8,690	8,728	678	
Chemist Analytical	Freking, R. J.	ABSO +2	5,411	5,411	5,411	2,309	
Physical Science Aid	Griddle, Louise	GS-4/1	4,480	4,630	4,628	317	
Supervisory Chemist	Talvitie, N. A.	SHSO +20	10,516	10,516	10,516	2,639	
Chemist Analytical	Garcia, W. J.	GS-11/5*	10,125	10,125	10,351	790	
Chemist Analytical	Demint, R. J.	GS-11/5*	10,125	10,125	10,351	790	
Chemist Analytical	Clark, D. A.	GS-11/3*	9,535	9,830	9,746	744	
Physical Science Technician	Sorenson, B. C.	GS-5/1	5,000	5,165	5,164	434	
Physical Science Aid	Farmer, R. J.	GS-4/3	4,780	4,930	4,863	366	
<u>Temporary Position</u>							
Aquatic Sampler	Vacant	WB-4/1	4,347	-	2,172	128	Terminates 12/31/65
					362,006	56,140	418,146 TOTAL

*Shortage Category Salary Rate
Step-in-grade increases included

1/ Position may be replaced by establishing an additional economist position.
Economist position would be filled by G. Collins, GS-12 for 6-month period.
Compensation would be approximately same as provided for GS-5 for 1 year.

BUDGET - FY 65 AND 66Analysis by Object ClassRegion VIII - Denver, ColoradoColorado River Basin Project

<u>Request</u>	<u>Estimate 1965</u>	<u>Estimate 1966</u>	<u>Increase or Decrease</u>
11 Personnel Compensation (Total)	320,600	366,000	+45,400
Compensation other than consultants	320,100	362,000	+41,900
Consultants' fees	500	4,000	+ 3,500
12 Personnel benefits	50,700	56,200	+ 5,500
21 Travel			
Change of station including dependents and dislocation allowance	2,900	2,600	- 300
Car Rental (all sources)	4,500	4,500	-0-
Other Travel	41,000	38,400	- 2,600
22 Transportation of things			
Change of station	11,000	8,000	- 3,000
Other	21,000	16,000	- 5,000
23 Rents, communications & utilities (Do not include space rental)	7,200	6,200	- 1,000
24 Printing and Reproduction	2,500	3,500	+ 1,000
25 Other services			
Contracts	<u>1965</u>	<u>1966</u>	
University of New Mexico	121,000	40,000	-81,000
Other than Contracts	62,800	41,800	-21,000
Dept. of Agriculture (ERS)	40,000	*25,000	
Sample Collectors	8,600	8,600	
Aerial Survey Photos	750	500	
Instrument measurement and maintenance	-0-	2,000	
Stream measurements (USGS)	7,200	2,450	
STORET and/or ADP	5,000	2,000	
Miscellaneous	1,250	1,250	
	<u>62,800</u>	<u>41,800</u>	

BUDGET (Continued)

Request for Funds, FY 1965 and 1966

Region VIII - Denver, Colorado

Colorado River Basin Project

	<u>Estimate 1965</u>	<u>Estimate 1966</u>	<u>Increase or Decrease</u>
26 Supplies and materials	<u>14,336</u>	<u>14,800</u>	<u>+ 464</u>
31 Equipment	<u>1,000</u>	<u>2,000</u>	<u>+ 1,000</u>
	<u>660,536</u>	<u>*600,000</u>	<u>-60,536</u>
Transferred to Headquarters 2/5/65	<u>10,000</u>	<u>-0-</u>	
	<u>670,536</u>	<u>*600,000</u>	<u>-70,536</u>
Transferred to Headquarters 10/15/64	<u>15,000</u>	<u>-0-</u>	
	<u>685,536</u>	<u>*600,000</u>	<u>-85,536</u>

*It is indicated that a total of \$50,000 may be required for the ERS Contract with the U. S. Department of Agriculture for FY 1966. The budget provides for only \$25,000 of this amount. We anticipate that the additional \$25,000 would be available from Branch Headquarters if required.

Region VIII, Denver, Colorado

ANALYSIS BY ACTIVITY

Colorado River Basin Project

Activity	Project Headquarters		Phoenix Field Station		Salt Lake City Laboratory		Total	
	1965	1966	1965	1966	1965	1966	1965	1966
Project Direction and Administration								
11:00	38,423	44,947	21,044	-- 2/	28,378	29,209	87,865	74,176
25:00					1,250	1,250		
Economic Studies								
11:00	4,372	13,106 1/	--	--	--	--	4,372	13,108
25:00	161,000	65,000	--	--	--	--		
Pollution Control								
11:00	47,702	60,509	--	--	--	--	47,702	60,509
25:00								
Pollution Control Benefits								
11:00	38,310	42,443	--	--	--	--	38,310	42,943
25:00								
Radiological Surveillance								
11:00	6,083	11,268 1/	--	--	--	--	6,083	11,268
25:00	8,550	8,300	--	--	--	--		
Inorganic Laboratory								
11:00	--	--	--	--	42,751	43,361	42,751	43,361
25:00								
Radiological Laboratory								
11:00	--	--	--	--	49,591	50,991	49,591	50,991
25:00								
Measurement & Sampling								
Data Analysis & Evaluation								
11:00	--	--	43,409	65,650	--	--	43,409	65,650
25:00			13,000	7,250	--	--		
Sub Total	134,890	172,795	64,473	65,650	120,720	123,561	320,083	362,006
	169,550	73,300	13,000	7,250	1,250	1,250	183,800	81,800
Consultants	500	4,000	--	--	--	--	500	4,000
Total	11:00						320,600	366,006
GRAND TOTAL	11:00 & 25:00						504,400	447,806

1/ Tentatively planned to establish additional economist position to be filled for 6 months period by G. Collins. This position would replace Eng. Tech. GS-5 in Radiological Surveillance Section. If this plan is carried out, object class 11:00 would be increased approximately \$5,000 for economic studies and decreased \$5,000 for radiological surveillance. 2/ Phoenix Field Station to be closed June 1965. All costs for 1966 included in Measurement and Sampling, Data Analyses and Evaluation.

Region VIII, Denver, Colorado		ANALYSIS OF EXTERNAL EXPENSES F.Y. 1965 and F.Y. 1966		Colorado River Basin Project	
RECIPIENT	DESCRIPTION OF WORK	METHOD OF PAYMENT *	1965 ESTIMATE	1966 ESTIMATE	
General Services Administration	Car and truck rental	R	\$ 23,800	\$ 18,900	
General Services Administration	Telephone	R	6,900	5,900	
Government Printing Office	Report reproduction	R	2,000	3,000	
Private Individuals	Sample collection	P	8,600	8,600	
Department of Agriculture	Economic Research Survey	R	40,000	25,000	
U. S. Geological Survey	Stream measurement	R	7,200	2,450	
University of New Mexico	Economic study	C	121,000	40,000	
(Undetermined at this time)	STORET	C	5,000	--	
Various firms	Goods and services	P	17,336	22,950	
SEC, PHS	Data processing	R	--	2,000	
			\$231,836	\$128,800	

* C - Contract
 R - Reimbursement to other Federal Agency
 P - Purchase Order

March 1, 1965

PERSONNEL SUMMARY

Colorado River Basin Project

Region VIII, Denver, Colorado

	FISCAL YEAR 1964			FISCAL YEAR 1965			FISCAL YEAR 1966		
	Project Hdqtrs.	Phoenix Field Sta.	SLC Laboratory Total	Project Hdqtrs.	Phoenix Field Sta.	SLC Laboratory Total	Project Hdqtrs.	SLC Laboratory Total	
Number of Permanent Positions	20	9	20 ^{1/}	22	12	14	34 ^{2/}	14	48
Number of Filled Permanent Positions - End of FY	17	10	16	22	12	14	32	14	46
Number of Filled other than Permanent Positions - End of FY	-	-	-	-	1	-	-	-	-
Total Permanent Man Years	16.4	7.0	18.8	17.8	10.1	14.0	33.0	14.0	47.0
Total other than Permanent Man Years	-	-	-	-	.3	-	.3	-	.5

1/ Organic Chemistry Laboratory phased out at end of FY 64

2/ Phoenix Field Station to be closed June 1965. Personnel to transfer to Headquarters Office and Grand Junction temporary depot. Start phase out January 1966.

ANALYSIS OF 1965 VACANCIES

Total Number of Permanent Positions (Allowance) 49

Total Filled Positions as of January 1, 1965 (Actual) 41

Unfilled Positions as of January 1, 1965 8

Unit and Position Title	Grade or Rank	Series	Pos. No.	Duty Station	Candidate	Est. EOD	Recruitment Act. Requested	Remarks
Economist, Project Direction	GS-13	110	BSS-4178	Denver, Colo.	Smith, Carl	3/1/65	Yes	Inter-Agency Transfer 3/1/65
Sanitary Engineer, Pollution Control Benefits	ASE	819	--	Denver, Colo.	Ortolano, L.	1/1/65	--	Transfer from R.O. 1/1/65
Sanitary Engineer, Pollution Control Benefits	ASE	819	--	Denver, Colo.	Bennett, F.	2/15/65	--	OAD 2/15/65
Sanitary Engineer, Pollution Control	SASE	819	--	Denver, Colo.	- - - -	6/1/65	Yes	
Hydrologist, Pollution Control	GS-9	1315	EH-63-492	Denver, Colo.	Baez, C.	4/15/65	Yes	Expect to promote Baez from Eng. Tech. GS-7. Plan to fill Eng. Tech. 6/1/65
Aquatic Sampler, Field Station	WB-4	3501	EH-64-21 1A	Grand Junction, Colo.	- - - -	3/1/65	Yes	
Engineering Technician, Field Station	GS-5	802	EH-64-684 2/	Denver, Colo.	- - - -	6/1/65	Yes	
Engineering Technician, Radiological Surveillance	GS-5	802	171 4/	Denver, Colo.	- - - -	6/1/65	Yes	
Sanitary Engineer, Field Station 2/	ASE	819	-- 3/	Denver, Colo.	- - - -	6/1/65	Yes	2/

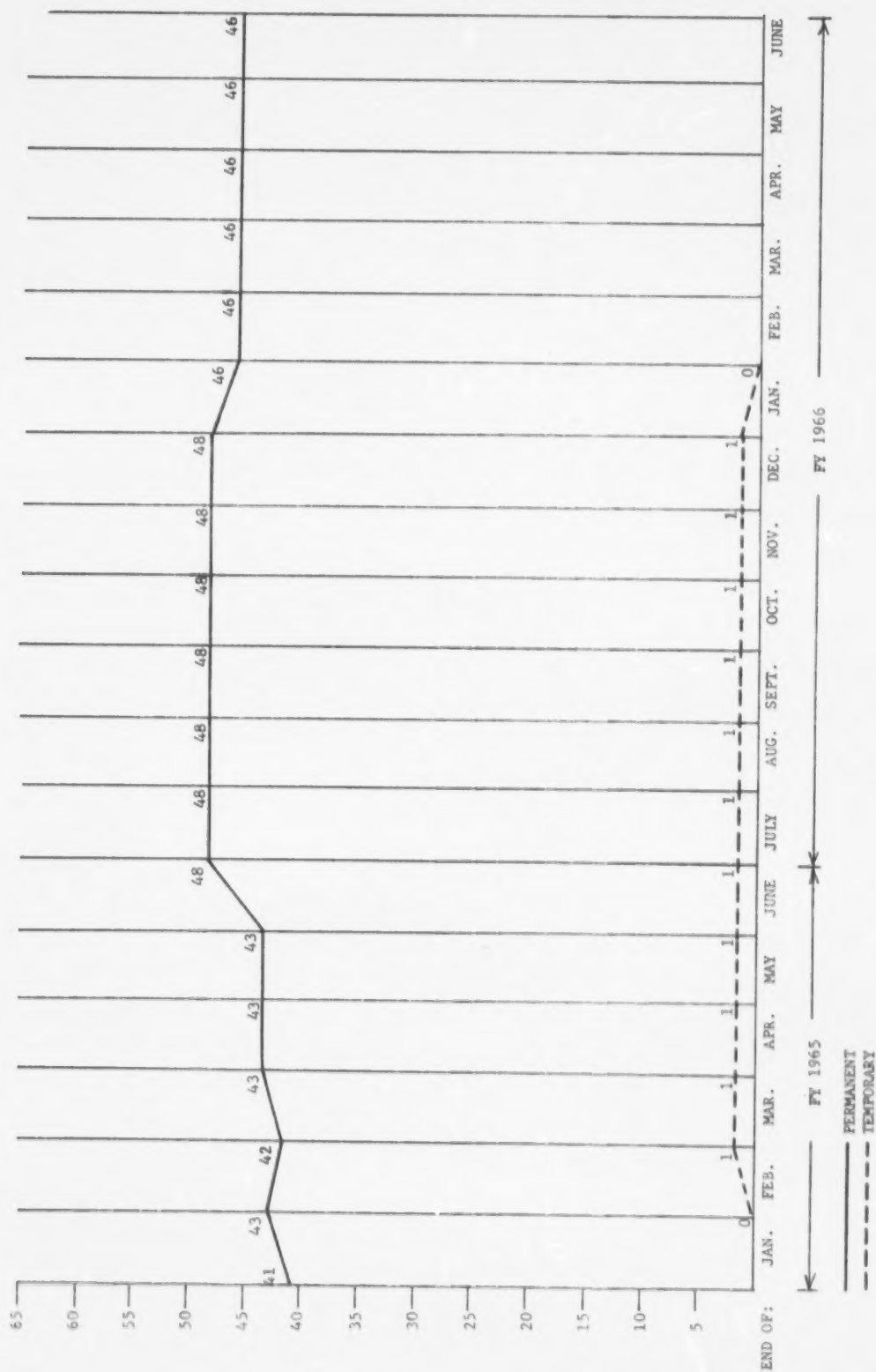
1/ Anticipate that Positions will not be filled until 6/1/65 because of personnel freeze.

2/ Sanitary Engineer vacancy exists 3/1/65 when M.B. Rainey reassigned as Deputy Project Director to replace Fitzpatrick. Fitzpatrick transferred 2/1/65 to Regional Office.

3/ Positions to be filled at Denver concurrent with closing of Phoenix Field Station and transfer of data evaluation personnel to Denver in June 1965.

4/ An additional economist position may be established to replace GS-5 Eng. Tech. position. Position would be occupied by G. Co. ins. Economist, GS-12, from June to December 1965.

PROJECTED MONTHLY EMPLOYMENT
Colorado River Basin Project



SUPPLIES AND EQUIPMENT AVAILABLE FOR TRANSFER
FY 1965 - 1966

March 1, 1965

Region VIII, Denver, Colorado

Colorado River Basin Project

Quantity	Item of equipment	Trade name	Condition	Date available for transfer	Remarks
1	Sterilizer, Autoclave	Barnstead	-	3-1-65	Fisher Cat. No. 0704
1	Refrigerator, 7 cu. ft.	-	very old, serviceable	3-1-65	-
4	Aquaria, 50 gal.	-	-	3-1-65	Glass and stainless steel
1	Sterilizer, hot air, therm. control	-	-	3-1-65	-
1	Deminerizer, dual bed	Ilco Model HB 460	-	3-1-65	-
	Dissecting equip., pans, pins, clippers, etc.	-	-	3-1-65	-
	Aquarium supplies, misc., air pumps, heaters, filters, nets, air stones, valves, tubing, etc.	-	-	-	-
24	Bottles, 5 gal.	-	-	3-1-65	-
5	Tanks, 50 gal.	-	-	3-1-65	Glass, widemouth
1	Sampler, water, 1200 ml	Foerst	-	3-1-65	Polyethylene, round, w/lids & spigots
1	Sampler, water, 3000 ml	Foerst	-	3-1-65	-
1	Sampler, bottom	Surber	-	3-1-65	-
4	Nets, plankton, tow	-	-	3-1-65	Fine and very fine
6	Nets, gill	-	new	3-1-65	1", 2", 3" mesh, 50 yds.
12	Seines, minnow	-	new and used	3-1-65	6, 10, 20, 30 ft.
	Dip nets	-	-	3-1-65	Round with handles

ANALYSIS OF EXISTING AND PROJECTED SPACE
FY 1965 - 1966 - 1967

Region VIII, Denver, Colorado

March 1, 1965

Colorado River Basin Project

Major Organizational Unit	Location	Utilization	Square feet	Estimated costs	Rent and/or utilities	Date of occupancy	Bureau approval obtained	Remarks
				1965	1966	1967		
I. PROJECT HEADQUARTERS	Bldg. 22, Denver Fed. Hdqtr. complex, Denver, Colo.	Office for ponents-G	3,540	*	*	*	Yes, 3,540 sq. ft. only	1/
II. SALT LAKE CITY LABORATORY	1750 S. Redwood Rd., Salt Lake City, Utah	Office-G Lab-S	1,370 6,980	*	*	*	Yes	
III. PHOENIX FIELD STATION	1320 N. First St., Phoenix, Arizona	Office-G	2,485	\$9,139	\$9,139	None	Yes	2/
IV. TEMPORARY FIELD DEPOT	Grand Junction, Colorado	Storage & workshop area & operations base for Upper Basin Sampling-G		(est.) (est.) (est.)	(est.) (est.) (est.)	(est.) (est.) (est.)	Requested	3/

1/ Bureau approval requested 2-10-65 for additional 2,100 sq. ft. to accommodate personnel to be transferred from Phoenix Field Station in June 1965.

2/ Agreement with private owner, to be terminated 6-30-65. Paid for by Division in Washington, D.C.

3/ Bureau approval requested 1-29-65 for 1,000 sq. ft. space at Grand Junction, Colo. for temporary depot for period 3-1-65 thru 12-31-65.

G = General purpose
S = Special

* Property controlled by GSA. All operating and maintenance costs paid by GSA.

APPENDIX "A"

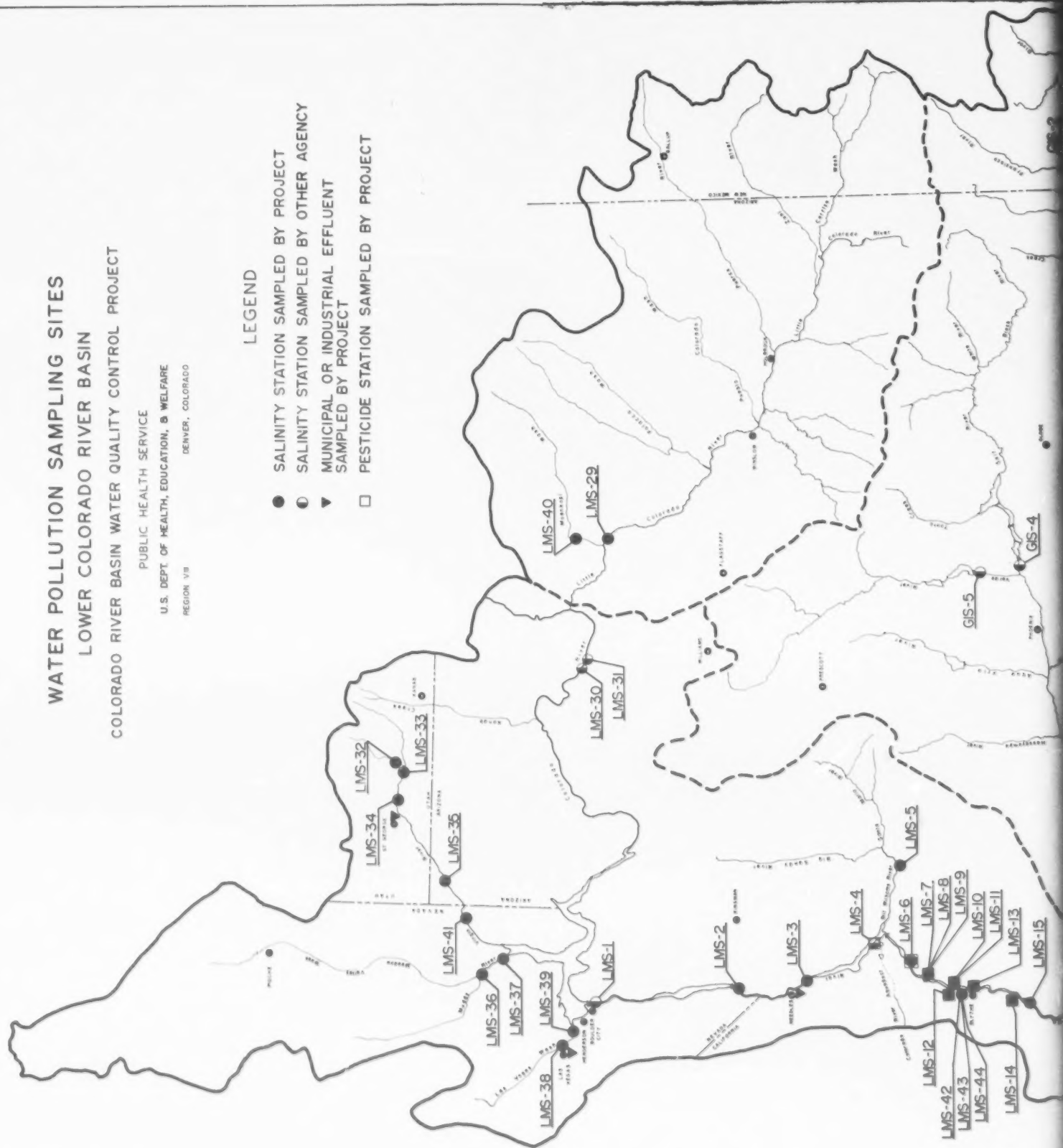


WATER POLLUTION SAMPLING SITES LOWER COLORADO RIVER BASIN COLORADO RIVER BASIN WATER QUALITY CONTROL PROJECT

PUBLIC HEALTH SERVICE
 U.S. DEPT. OF HEALTH, EDUCATION, & WELFARE
 REGION VIII
 DENVER, COLORADO

LEGEND

- SALINITY STATION SAMPLED BY PROJECT
- SALINITY STATION SAMPLED BY OTHER AGENCY
- ▼ MUNICIPAL OR INDUSTRIAL EFFLUENT SAMPLED BY PROJECT
- PESTICIDE STATION SAMPLED BY PROJECT



APPENDIX B

SECOND DRAFT
10-7-64

COLORADO RIVER BASIN WATER QUALITY CONTROL PROJECT

STATEMENT

This statement is presented as a support document to be used in the development of a Department policy instrument for satisfying the provisions in section 206 of Appropriations Act, 1965 (Public Law 88-605). This section reads as follows:

Except upon the approval of the President's Science Advisory Committee, none of the funds herein appropriated shall be used to conduct or assist in conducting, or carry on, undertake, or continue surveys, investigations, or any programs (including but not limited to, the payment of salaries, administrative expenses, the conduct of research activities and policing actions) in the field of salinity control or of irrigation water quality in the area drained by the Colorado River and its tributaries.

The Department of Health, Education, and Welfare has direct water pollution control responsibilities spelled out in the Federal Water Pollution Control Act, (Public Law 660 as amended by Public Law 87-88). Specifically, the Act declares as a matter of policy the following:

Section 1.(a) In connection with the exercise of jurisdiction over the waterways of the Nation and in consequence of the benefits resulting to the public health and welfare by the prevention and control of water pollution, it is hereby declared to be the policy of Congress to recognize, preserve, and protect the primary responsibilities and rights of the States in preventing and controlling water pollution, to support and aid technical research relating to the prevention and control of water pollution, and to provide Federal technical services and financial aid to State and interstate agencies and to municipalities in connection with the prevention and control of water pollution. To this end, the Secretary of Health, Education, and Welfare (hereinafter in this Act called the "Secretary") shall administer this Act.

Further, under the enforcement measures against pollution of interstate or navigable waters the Act specifies:

Section 8(a) The pollution of interstate or navigable waters in or adjacent to any State or States (whether the matter causing or contributing to such pollution is discharged directly into such waters or reaches such waters after discharge into a tributary of such waters), which endangers the health or welfare of any persons, shall be subject to abatement as provided in this Act.

The Act is also specific in the interpretation of water uses to be considered. Under section 2(a) of the Act relating to comprehensive programs for water pollution control are the statements "due regard shall be given to the improvements which are necessary to conserve such waters for public water supplies, propagation of fish and aquatic life and wildlife, recreational purposes, and agricultural*, industrial, and other legitimate uses. For the purpose of this section, the Secretary is authorized to make joint investigations with any such agencies of the condition of any waters in any State or States, and of the discharges of any sewage, industrial wastes, or substances* which may adversely affect such waters."

That an anomaly exists as to the intent of Congress in the matter of water quality and pollution control is apparent. The history of broad Federal water pollution control legislation dates from 1948 when the first Federal Water Pollution Control Act was passed. Revamped to reflect the tenor of the times for strong pollution control legislation, the 1956 Act (Public Law 84-660) was passed. This Act was measurably strengthened in 1961 (Public Law 87-88) with amendments designating the Secretary as being responsible for its implementation. This year, the Congress considered even more comprehensive pollution control legislation (S.B. 649) to strengthen the Secretary's position in carrying out his responsibilities to the Country.

*Our emphasis

Most state water pollution control legislation reveals a similar pattern of progress toward general laws which pertain to any discharge or drainage that affects the usefulness of the waters for any purpose. Thus, the legislation of the 1920's often contained exemptions for particular kinds of wastes or of wastes of particular origin. For instance, the West Virginia law contained this wording:

"Provided, however, that such Commission shall not institute proceedings against any person engaged in the mining of coal and draining mines in compliance with existing laws." West Virginia Laws of 1947, Chap. 126, sec. 5.

This provision was deleted in 1953, Laws of 1953, chapter 145.

Again, in the Colorado River Basin State of Wyoming, a bill was introduced to amend the State Water Pollution Control Authority in the 1960-61 session of the legislature. The exclusionary character of the amendment is reflected in the following wording:

"Provided however, that the introduction of silt into a stream as a result of agricultural operations or of the processing of agricultural products shall not be deemed to constitute stream pollution which affects public health."

This exclusionary amendment was strongly opposed by the Water Pollution Control Council and failed to pass the legislature. (See Appendix A for the text of this amendment.)

Advocates of pollution control consider the elimination of these exemptions or immunities from the statutes as milestones in the progress toward cleaner waters. Any action which would reinstitute such exemptions in any form would be a significant step backwards.

The attitudes of the various states are important factors in the effective implementation of the Federal Water Pollution Control Act. Recognition of interstate or basin-wide problems beyond the physical staff capability

of the individual states serves as a primary justification for the duly authorized and responsible state water pollution control agencies to request assistance under the provisions of the Federal Water Pollution Control Act.

During the period November-December 1959, the official water pollution control agencies for the States of Arizona, California, Colorado, Nevada, New Mexico, and Utah requested assistance under section 8 of the Federal Water Pollution Control Act in the matter of pollution of the interstate waters of the Colorado River and its tributaries. Copies of these letters of request are in Appendix B of this document. An important element common to these requests was that all problems of pollution of the Colorado River and its tributaries - radioactive, biological, and chemical - were to be considered.

The primary concern of the States in the Colorado River Basin during this period was radioactive pollution from industrial and natural sources. The first session of the Conference, which met on January 13, 1960, established the Colorado River Basin Project, with a staff of twenty-three (23), to perform an intensive survey of radioactive pollutants in the Basin. Within a period of three years, close cooperation between the seven States of the Basin, the U. S. Department of Health, Education, and Welfare, several mining and milling industries, and the U. S. Atomic Energy Commission brought about a substantial reduction in the radioactive content of Colorado River water. At the fourth and fifth sessions of the Conference, in May 1963 and May 1964, the Conferees were informed that the River's radioactive content is consistently below those levels recommended as maximum for drinking water by the U. S. Public Health Service. A surveillance network of monitoring stations has been established to detect radioactivity and insure protection of downstream water users.

For the radiological pollution phase of the enforcement action, it was necessary to develop analytical methods to measure the various forms of radiochemical activity in water and sediments. Analytical techniques and refinements were developed in the Project's Salt Lake City Laboratory and include methods for radium-226, polonium-210, lead-210, thorium isotopes and uranium in sediments. The method for radium-226 is being considered for inclusion in "Standard Methods - Water and Waste Water." Requests for details on these techniques are received on a continuing basis from universities, industries, and governmental agencies throughout this country and the world. For example, at this time, the USGS is initiating a sampling program on 12 major rivers in this country to determine radiochemical levels. Requests for details on analytical procedures have been received from the USGS and the Project staff is working with them on this matter.

In its presentations to the Conference, the Colorado River Basin Project has developed a series of reports on radiological pollution in the Colorado River Basin. These are listed along with scientific papers prepared by various Project staff members and service consultants in Appendix C of this document.

Although the radiological pollution problem in the Colorado River Basin was a primary concern of the Conference at its first session (January 13, 1960 in Phoenix, Arizona), the Conference specifically asked that consideration be given to all forms of pollution and specifically that mineralization (salinity) from irrigation be included in the investigations. Also participating were other interested State and Federal agencies, including the U. S. Geological Survey and the Bureau of Reclamation.

The problem of high total dissolved solids content of the Colorado River was further emphasized by the Arizona Conferee at the second session of the Conference held on May 11, 1961. He brought to the attention of the Conferees the detrimental effects of the highly saline waters of the Colorado River on the water supply of Yuma, Arizona resulting from the pumping of saline water from the Wellton-Mohawk Irrigation District.

A further reflection of the attitudes of the various states can be characterized by the concern of Dr. David Willets, California Department of Water Resources, who made the following statement at the Second Session of the Conference on May 9-10, 1962:

"I would like to emphasize one point, and that is that in California we are making extensive plans today for the operation of our water resources. We are planning to use and re-use our water resources many times, and this has been expressed here in this Conference many times. We are at this time planning a ten-million gallon per day plant to reclaim the sewage, as a pilot plant, from the San Gabriel Valley, and re-charge ground water with that re-used water. In the Santa Ana Valley, east of Los Angeles, we use and re-use our water supply many times, so that the quality of water supply to that Valley is very important to us in considering how many times we can re-use it. We are mindful of the quality of Colorado River water, because a few years ago the total dissolved solids content exceeded 800 parts per million. Obviously, we cannot use and re-use that kind of water. We can use it maybe once before we have to dispose of it. If it were of better quality, we could re-use it several times.

We are concerned, then, with the quality of water received by the Lower Basin. We do not want the Lower Basin to be in the same position as Yuma is today, caused by irrigation return water. This is why we are certainly glad to see that the Public Health Service is seriously considering the evaluation of all the water quality data, and we hope that it will permit the accurate evaluation of what our future water quality will be. As I have stated, this is a vital water resource to all of Southern California."

During the third session of the Conference held on May 9-10, 1962, the Project's staff presented its findings and plan for continuing the investigation

of salinity. At the request of the Public Health Service, some data on water quality in the Colorado River Basin was made available by the U. S. Geological Survey. However, the data was incomplete with respect to coverage and no interpretation of the data was provided. After further discussions with the Geological Survey and the Bureau of Reclamation, the Public Health Service decided it would need to undertake a field program to complete these data and their interpretation.

At the fourth session of the Conference on pollution of the Colorado River, held May 27-28, 1963, the Conferees recommended that the increasing total dissolved solids content of the River water be given principal attention in the future. The Conferees directed the Project staff to determine (1) pollution sources and concentrations throughout the River, and (2) feasible measures for restoring and protecting water quality so as to permit maximum economic growth and development of the Colorado River Basin. Representatives of the Department of Interior participated in the Conference discussions and pledged cooperation with the Department of Health, Education, and Welfare in the study. Verbatim transcripts of each Conference have been published including the official summaries by the Secretary of Health, Education, and Welfare ^{1/} (refer to Appendix H of this document).

With the primary concern of the Federal-State Conferees on pollution due to total dissolved solids (i.e. salinity), the Project staff was oriented to the investigation of pollution sources and development of feasible methods to control this type of pollution.

^{1/}The Fifth Session Conference transcript is published but undistributed pending release of the summary by the Secretary, DHEW.

The Colorado River Basin Water Quality Control Project as the technical arm of the Enforcement Conference is attacking the specific pollution problem due to salinity through the use of an engineering-economic program. The justification of the necessary measures for the control of salinity pollution is based upon the effect of varying water quality on the economy of the Colorado River Basin. It is anticipated that a program for the control of pollution for the interstate waters of the Colorado River Basin and its tributaries can be recommended to the Conferees during Fiscal Year 1967.

The conference technique of enforcement actions such as has been taken in the Colorado River Basin depends upon a regular infusion of sound technical information on which the Conferees may develop the necessary sociological and political support needed to implement the ultimate recommendations for control and management measures. Thus, for example, a preliminary picture of real and expected water use damages in terms of their effect on the economy of the Colorado River Basin and its tributary areas, and coupled with an example of an economic and technically feasible control measure to reduce salinity substantially are of significant value to the Conferees as an awareness tool to develop support for a rational program of control. In those instances where identifiable pollution sources can be readily controlled, through the direct efforts of an individual State water pollution control agency, firm recommendations for such control are made to the Conferees prior to the submission of the final report.

The economic aspect of the Project's study fills a central role in the development of a mathematical tool as a means of giving content to the

concept of "welfare." The Project's economic contractor was selected because of his intimate associations and familiarity with the development of the Colorado River Basin. The economic study is delineating the level and pattern of economic activity for the years 1965, 1980, and 2010 by means of input-output tables. It is anticipated that the major portion of the economic contract will be completed by August 1965. Additional consultation with the principals of the economic study will be required beyond that point to merge the economic and engineering components of the Project.

With the availability of a sophisticated tool such as is being developed by the economic contractor, the Project's engineering activities take on a new dimension in demonstrating pollution and need for control. Its major efforts are directed toward the assessment of damages due to pollution from salinity and the development of feasible control measures or approaches for all sources of salinity whether they be agricultural, municipal, industrial, or natural. An analysis of water quantity as a constraint on the level and pattern of economic activity is underway using expected water demands for the periods 1965, 1980, and 2010. An analysis of the relation of benefits to the costs based on present water quality at various combinations of control programs for salinity pollution sources is an integral element in merging the engineering-economic components. Using the economic projections similar analyses will be made for the periods of 1965, 1980, and 2010 taking cognizance of the changes in water use as decreed by the U. S. Supreme Court's allocation of water and the development of various water resource projects proposed by the various construction agencies within the study period.

The Project is currently embarked on the program outlined. It is concentrating its efforts in those areas which will have the greatest impact.

Arizona State Department of Health
Phoenix

0 54 58111 4 0 7 1 1 4

November 4, 1959

Dr. L. E. Burney, Surgeon General
Public Health Service, DHEW
Washington 25, D. C.

Through: Dr. C. F. Blankenship,
Regional Medical Director, Region IX
San Francisco 2, California

Dear Doctor Burney:

When in Washington several of the State Health Officers from the Colorado River Basin area mentioned to you the desirability of your calling a conference to deal with the problems of pollution of the Colorado River and its tributaries.

This is to request such a conference under Section 8 of Pl. 660 and we believe that because of potential danger to this important water supply the conference should be held as soon as convenient for you to arrange it.

Very sincerely,

C. G. Salisbury
C. G. Salisbury, M.D.
Commissioner

CGS/mr



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STATE OF CALIFORNIA
STATE WATER POLLUTION CONTROL BOARD

ROOM 316 1227 O STREET
SACRAMENTO 14, CALIFORNIA

December 4, 1959

EXECUTIVE OFFICER

PAUL R. BONDERSON

TELEPHONE: MICRONY 5-4711
LOCAL 3881

**Dr. L. E. Burney, Surgeon General
U. S. Public Health Service, DHEW
Washington 25, D.C.**

**Through: Dr. C. F. Blankenship
Regional Medical Director, Region IX
San Francisco**

Dear Dr. Burney:

At its meeting on December 2, 1959, the California State Water Pollution Control Board instructed me to respectfully request the Surgeon General to call a conference of state water pollution control agencies under Section 6, Public Law 84-660, to consider the problems of pollution of the Colorado River watershed.

I have been authorized to represent the Board at such a conference.

Very truly yours,

Paul R. Bonderson
PAUL R. BONDERSON
Executive Officer

cc: Malcolm H. Merrill, M.D.
Stanley J. Leland, M.D.
R. L. Cleere, M.D.
C. G. Salisbury, M.D.

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STATE OF COLORADO
DEPARTMENT OF PUBLIC HEALTH

STATE OFFICE BUILDING, DENVER 2

November 18, 1959

Surgeon General L. E. Burney
Public Health Service
Washington 25, D. C.

Dear Doctor Burney:

On September 16, 1959, this Department requested the assistance of the Public Health Service in solving a number of radioactive and chemical water pollution problems in Colorado. A copy of this letter is attached.

Recently I have had an opportunity to discuss this matter with other State Health Officers in the Colorado River Basin States and have learned of their concern regarding radioactive pollution of the Colorado River water. I believe we are agreed that the problems of pollution control in the Basin can best be solved by a Basin-wide approach rather than on a State by State basis.

It is, therefore, requested that you call a Conference of appropriate State Water Pollution Control Agencies, as authorized under Section 8 of the Federal Water Pollution Control Act (Public Law 660 - 84th Congress), for the purpose of evaluating the present degree of biological, chemical and radioactive pollution of the Colorado River and its tributaries.

The Colorado River is a great natural resource. It must be protected against damaging pollution. In view of the long-lived nature of radioactive and chemical pollutants that are now being discharged to the streams of the Basin, I consider early attention to this problem to be essential.

Yours very truly,

E. L. Cleere, M. D., M.P.H.
Executive Director

RC-WNO:dp
cc: Regional Office
Attachment





Chief, ASH
9/12/59

Nevada State Department of Health

CARSON CITY, NEVADA

December 1, 1959

L. E. Burney, M.D.
Surgeon General
Public Health Service
Washington, D. C.

Through C. F. Blankenship, M.D., Regional
Medical Director, Region IX

Dear Dr. Burney:

I have a copy of the letter Dr. Stanley Leland, Director of the New Mexico Department of Public Health wrote requesting you to call a conference on the problems of the pollution of the Colorado River and its tributaries. This request was considered by the Nevada State Board of Health at a special meeting held in Las Vegas, Nevada on November 20, 1959. The Board voted unanimously to support the recommendation of the New Mexico Department of Public Health.

Sincerely,

Daniel J. Hurley
Daniel J. Hurley, M.D.
State Health Officer

DJH:lb

cc: Stanley Leland, M.D.
G. C. Salsbury, M.D.
R. L. Cleere, M.D.
Malcolm Merrill, M.D.
George W. Soffe, M.D.
Hugh Shamberger
W. W. White

Date Dec. 3, 1959
Respectfully Forwarded:

Emil E. Palmquist
Acting Regional Medical Director
PHS, DHEW REGION IX



NEW MEXICO
DEPARTMENT OF PUBLIC HEALTH
SANTA FE

November 2, 1959

AIR MAIL

Surgeon General L. E. Burney
Public Health Service
Washington 25, D. C.

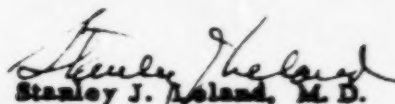
Through: Richard F. Boyd, M. D., Regional Medical Director, Region VII

Dear Doctor Burney:

The New Mexico Department of Public Health respectfully requests the Surgeon General to call a conference under Section 8, Public Law 640. This conference to consider the problems of the pollution of the Colorado River and its tributaries with the purpose of formulating recommendations to the United States Public Health Service.

It is respectfully requested that the various states involved be considered as members of the conference together with such persons of the United States Public Health Service as the Surgeon General would deem interested parties.

Respectfully,


Stanley J. Heland, M. D.
Director

cc: Mr. Murray Stein
G. C. Salisbury, M. D.
Malcolm H. Merrill, M. D.
R. L. Cleere, M. D.
Daniel J. Hurley, M. D.
George W. Soffe, M. D.
Mr. Charles G. Caldwell



UTAH STATE DEPARTMENT OF HEALTH

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45 FORT DOUGLAS BLVD
SALT LAKE CITY 13, UTAH

GEORGE W. SOFFE, M.D.

DIRECTOR



December 3, 1959

The Surgeon General
U.S. Public Health Service
Washington 25, D.C.

Dear Sir:

The Utah Water Pollution Control Board, at a meeting held December 1, 1959, voted to join certain other Colorado River Basin states in requesting a conference on the problems of Colorado River pollution under the terms of Section 8, Public Law 640, 84th Congress.

The Utah State Board of Health at a meeting held December 3, 1959 voted to support the Water Pollution Control Board in this action.

It is hoped that through such a conference the means will be provided for a complete study of the effects on the Colorado River and its tributaries of radiological, chemical and biological pollution.

Very truly yours,

UTAH WATER POLLUTION CONTROL BOARD

Lynn M. Thatcher
Executive Secretary

UTAH STATE DEPARTMENT OF HEALTH

1st-v
cc Regional Office, USPHS, Denver
Dr. C. G. Salisbury, Arizona
Dr. R. L. Cleere, Colorado
Dr. Stanley J. Leland, New Mexico
Dr. Malcolm M. Merrill, California
Dr. Daniel J. Marley, Nevada

George W. Soffe, M.D.
Director of Public Health

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Mr. Stearns

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THE PRESIDENT'S SCIENCE ADVISORY COMMITTEE
Executive Office Building
Washington 25, D. C.

December 21, 1964

Dear Mr. Secretary:

On October 27, 1964, I advised you that the President's Science Advisory Committee had approved continuation of the Colorado River Basin Enforcement Project for a period of ninety days from the date of the Committee action, October 19. This action was in response to Section 206 of your 1965 Appropriation Act.

Subsequent to its action of October 19, the Committee appointed a special panel to investigate the project. The panel held seven full days of hearings--two in Washington and five in the field. Representatives of the seven states and of the Departments of the Interior and Agriculture were heard as well as representatives of your Department. On the basis of these findings the Committee concludes that:

1. The HEW activities in question do not duplicate those of any other agency.
2. The HEW activities are technically sound.
3. The HEW program will yield results which will be of value in the planning for the Colorado River.
4. Termination of the study at this time would result in a loss of substantial Federal investment in the effort.

Therefore, the President's Science Advisory Committee approves the continuation of the HEW activities in the Colorado River basin related to salinity control and irrigation water quality in accordance with the general plan outlined in the amended presentation

-2-

to the sub-panel. /Summary of Activites in Colorado River
Basin in the Fields of Salinity Control and Irrigation Water
Quality, November 12, 1964

Sincerely,

Donald F. Hornig
Chairman

Honorable Anthony J. Celebrezze
Secretary of Health, Education, and Welfare
Washington, D. C.